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JUST THREE MILLION TONS.

IRON ORE ON LAKE ERIE DOCKS—NEARLY A MILLION AND A HALF MORE THAN A YEAR AGO—CONSUMPTION DURING THE PAST YEAR IS JUST THAT MUCH SHORT OF THE PREVIOUS TWELVE MONTHS.

Reports to the Marine Review from dock managers at all Lake Erie ports show that in the year ended with the first of the present month the movement of iron ore to furnaces was 1,414,621 tons less than during the year ended May 1, 1900. The total figures are 15,882,881 tons (gross tons, of course, in all cases) forwarded from Lake Erie ports during the year ended May 1, 1900, against 14,468,260 tons during the year ended May 1, 1901. The shortage is due to light shipments during the past winter. Furnace yards were more fully stocked when navigation closed last fall and did not require the surplus stocks at Lake Erie ports as they did a year ago. Then, too, there was a period when the furnaces were not making as much iron as they were during the "boom" early in 1900. In the winter period from Dec. 1, 1899, to May 1, 1900, shipments from docks to furnaces aggregated 3,809,627 tons, against 2,854,487 tons between Dec. 1, 1900, and May 1, 1901.

Still the amount of iron ore on dock on the first of the present month is not as large as was expected. The reports show 3,050,183 tons, compared with 1,720,656 tons in 1900, 2,073,254 tons in 1899, 3,167,915 tons in 1898, and 3,256,497 tons in 1897. In view of the present surplus compared with the past two years, the vessel owner, who considers these figures from the standpoint of lake freights, must rest his hopes in the shorter season, due to a late opening of navigation and to the strike of marine engineers. It is quite evident, however, that the loss of ship capacity, due to delay in opening of navigation, has not as yet balanced this difference of 1,329,527 tons in the amount of ore on dock.

The discussion in the foregoing paragraphs is based on these facts: We know that on Dec. 1, 1900, Lake Erie docks contained 5,904,670 tons of ore. If we deduct from this 3,050,183 tons, the amount now on dock, we find the shipments to furnaces from Lake Erie ports during the winter period (Dec. 1 to May 1) amounted to 2,854,487 tons, which, added to 11,613,773 tons, the amount shipped to furnaces during the navigation season in 1900, gives 14,468,260 tons as the entire consumption of ore from Lake Erie ports during the year ended May 1, 1901; against 15,882,881 tons in the year ended May 1, 1900; 12,122,982 tons in the year ended May 1, 1899, and 10,209,488 tons in the year ended May 1, 1898. The following tables give full details of stocks and shipments to furnaces during several years past:

IRON ORE ON LAKE ERIE DOCKS—GROSS TONS.

PORTS.	Opening of Navigation.			Close of Navigation.		
	May 1, 1901.	May 1, 1900.	May 1, 1899.	Dec. 1, 1900.	Dec. 1, 1899.	Dec. 1, 1898.
Toledo.....	138,457	52,616	22,915	242,375	186,422	146,568
Sandusky.....	63,148	4,300	7,086	95,111	23,184	48,500
Huron.....	135,043	48,412	82,055	211,377	164,480	139,982
Lorain.....	140,562	126,212	168,646	251,838	337,822	324,034
Cleveland.....	806,119	386,291	472,946	1,337,445	1,200,806	1,175,970
Fairport.....	306,706	282,298	289,417	611,717	692,147	719,794
Ashtabula.....	1,046,974	678,789	855,691	1,811,459	1,902,598	1,732,671
Conneaut.....	69,755	8,649	6,115	630,514	468,808	288,101
Erie.....	225,412	97,894	95,626	480,734	361,335	439,167
Buffalo.....	118,007	35,195	72,757	232,100	192,681	121,620
Total.....	3,050,183	1,720,656	2,073,254	5,904,670	5,530,283	5,136,407

IRON ORE ON LAKE ERIE DOCKS, MAY 1 OF EACH YEAR FOR TEN YEARS PAST.

Year.	Gross tons.	Year.	Gross tons.
1901.....	3,050,183	1896.....	1,949,698
1900.....	1,720,656	1895.....	2,642,890
1899.....	2,073,254	1894.....	2,588,370
1898.....	3,167,915	1893.....	2,095,797
1897.....	3,256,497	1892.....	1,537,188

IRON ORE SHIPMENTS, LAKE ERIE PORTS TO FURNACES, FULL YEARS.

Year ending	Gross tons.	Year ending	Gross tons.
May 1, 1901.....	14,468,260	May 1, 1898.....	10,209,488
May 1, 1900.....	15,882,881	May 1, 1897.....	6,719,633
May 1, 1899.....	12,122,982	May 1, 1896.....	8,805,510

IRON ORE SHIPMENTS, LAKE ERIE PORTS TO FURNACES, DURING WINTER PERIOD, DEC. 1 TO MAY 1.

Winter of	Gross tons.	Winter of	Gross tons.
1900-01.....	2,854,487	1897-98.....	2,755,840
1899-1900.....	3,809,627	1896-97.....	1,698,487
1898-99.....	3,063,153	1895-96.....	2,466,014

NORTHWESTERN GRAIN SITUATION.

G. A. Tomlinson, vessel agent at Duluth, says of the grain situation at the head of Lake Superior:

"Grain in store in local elevators aggregates 18,000,000 bushels. One year ago the quantity in warehouses at the head of the lakes was 16,000,000 bushels. Country elevator stocks (line houses) are reported to be but 2,500,000 bushels—the lightest on record for this season of year. The demand for tonnage is not very general, but as soon as there is general relief from the ice blockade shippers think the market will improve."

Notwithstanding the recent increase in the price of steel rails, railroads are still buying on a large scale and in some cases offering premiums to encourage delivery.

MARKED LOSS IN LAKE SUPERIOR FREIGHT MOVEMENT.

On May 1 a year ago nearly half a million tons of freight had passed to and from Lake Superior through the canals at Sault Ste. Marie. On May 1 of this year practically no freight had gone through the canals and it is now certain that the middle of the month will have passed (probably the end of the month) before the Lake Superior fleet is entirely in motion. The causes of this delay—strike of engineers and ice blockade in the St. Clair river—have already affected the lake freight market, and every day of suspension is in a way welcomed by the vessel owner, who expects improved carrying charges on account of a short season. If the volume of business to and from Lake Superior is to be equal to last year, every day of the blockade that has existed during the past two weeks means a loss of about 110,000 tons of Lake Superior freight alone, which must be made up in the balance of the season. This daily average of tons is figured from the total movement through the Sault of more than 25,500,000 net tons last year, so that up to this writing the loss has been considerably in excess of 2,000,000 tons. A general summary of Lake Superior commerce to May 1 during three years past, as made up from reports of the two canals at the Sault, follows:

Vessel passages.	Registered tons.	Freight tons.
To May 1, 1901.....	104	10,121 2,545
To May 1, 1900.....	427	539,191 473,482
To May 1, 1899.....	42	10,230

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To May 1, 1901.	To May 1, 1900.	To May 1, 1899.
Coal, anthracite, net tons.....	43,242 .....	.....	.....
Coal, bituminous, net tons.....	111,499 .....	.....	.....
Iron ore, net tons.....	204,563 .....	.....	.....
Wheat, bushels.....	2,541,627 .....	.....	.....
Flour, barrels.....	180 97,050 .....	.....	.....

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO MAY 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.				
ITEMS.	Designation.	To May 1, 1901.	To May 1, 1900.	To May 1, 1899.
Copper.....	Net tons.....	674 .....	.....	.....
Grain, other than wheat	Bushels.....	529,000 .....	.....	.....
Building stone.....	Net tons...	860 .....	.....	.....
Flour.....	Barrels.....	97,000 .....	.....	.....
Iron ore.....	Net tons...	204,563 .....	.....	.....
Iron, pig.....	Net tons...	.....	.....	.....
Lumber.....	M. ft. b. m.	.....	.....	.....
Silver ore.....	Net tons...	.....	.....	.....
Wheat.....	Bushels.....	2,541,627 .....	.....	.....
Unclassified freight.....	Net tons...	20 1,393 .....	.....	.....
Passengers.....	Number...	285 129 .....	.....	.....

WEST BOUND.

Coal, anthracite.....	Net tons...	43,242 .....	.....
Coal, bituminous.....	Net tons...	111,499 .....	.....
Flour.....	Barrels	180 50 .....	.....
Grain.....	Bushels....	23,530 .....	.....
Manufactured iron.....	Net tons...	1,410 .....	.....
Salt.....	Barrels	25,277 .....	.....
Unclassified freight.....	Net tons...	7,859 .....	.....
Passengers.....	Number ...	500 117 .....	.....

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

MANAGEMENT OF THE CORPORATION SHIPS.

[Special correspondence to the Marine Review.]

Duluth, Minn., May 7.—The Pittsburg Steamship Co., under which organization all the vessels comprising the United States Steel Corporation's fleet is assembled, has taken all the room on the fourth floor of the board of trade building at Duluth not occupied by A. D. Thomson & Co. and the Consolidated Elevator Co. This consists of six medium-sized offices and one large room about 50 by 50 ft. It is not expected that this will be sufficient room for the concern later. General Manager A. B. Wolvin will be located in these new quarters, as will A. F. Harvey, Mr. Wolvin's principal assistant at this end of the route. Mr. Wolvin will for the present retain also his offices upon the ground floor. The ships of the Pittsburg company are expected by Mr. Wolvin to carry about 10,000,000 tons of ore this year, and there has been contracted from Pickands, Mather & Co., James and John Corrigan, Harvey H. Brown, C. W. Elphicke, W. C. Richardson, John Mitchell, James Davidson, the Wilson Transit Co., International Steamship Co., Robert R. Rhodes, J. C. Gil-

There will be no supply house at the Sault, as some of the constituent companies have found practicable, but all buying will be at the Cleveland end. While smaller fleets might be supplied at the Sault successfully there will be at times so many of the ships of the new company there, and they will arrive at such times that serious delays might be occasioned by any supply station at that point. Messrs. Mills and Harvey, who will have practical charge of the two ends of the routes, are looked upon by their friends to make quite a record for themselves in this, the management of the biggest fleet of ships in the world.

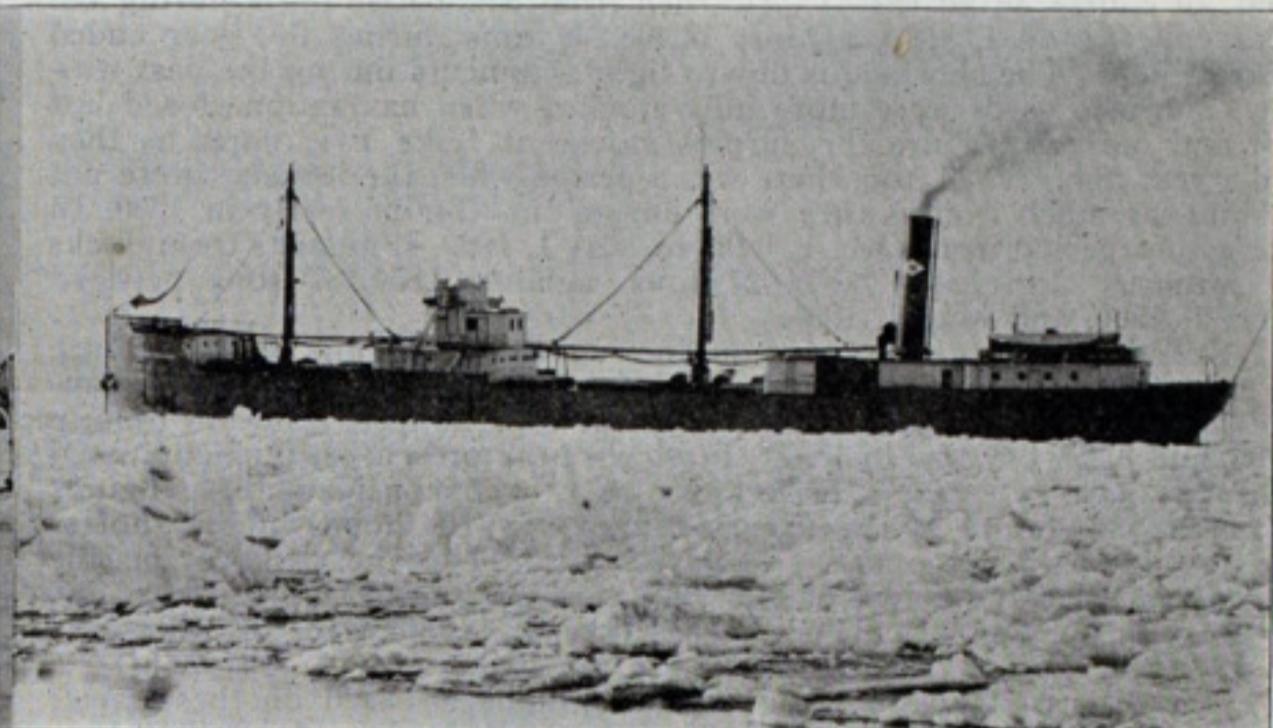
G. L. Douglas, Jr., has arrived at Duluth, and will enter the office of the Western Transit Co. It is expected that in time he will assume the duties of general agent for the line at this end. He will be under the tutelage of Capt. A. B. Wolvin this year.

It is the general expectation that an ore dock will be built at Fort William, Ont., this year. This will be to handle the ores of the Atikokan range, a deal for the purchase of which by interests connected with the United States Steel Corporation is approaching completion in New York. It was hoped by the new Canadian Northern road that it could get this

Scenes resulting from suspension of Lake navigation by ice jam in the St. Clair river during early part of May, 1901.



Freighters waiting at Detroit for the jam to break.



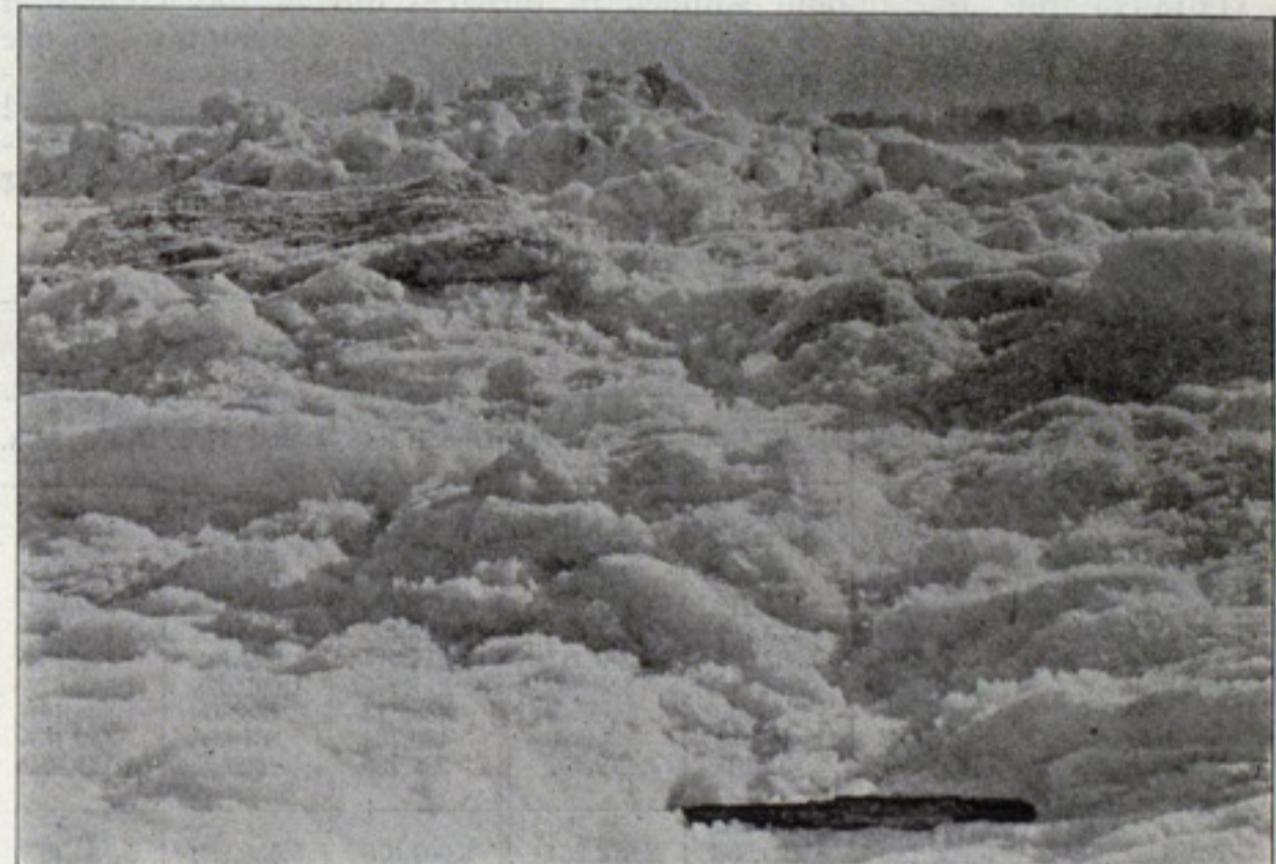
Steamer Northwestern, bound from Chicago to Liverpool, is held fast off Marine City, Mich.



Stern of schooner Uranus forced into pilot house of steamer H. S. Pickands at Marine City.

christ, Wm. Livingstone and probably one or two other vessel owners enough vessel capacity to move about 2,500,000 tons more. This aggregate, 12,500,000 tons, is very close to the limit of ore to be mined by Lake Superior properties of the big corporation.

It will probably be May 25 before the full fleet is in continuous operation, which means that there must be moved this year a vaster daily tonnage than any interest or aggregation of interests ever approached. Every day there must be transported about 60,000 gross tons of ore. All this means perhaps seventy-five train loads from mines to upper lake docks, fifteen to eighteen cargoes and an immense volume of ore at Lake Erie docks. The company is starting in with an upper lake manager at Duluth in the person of Mr. Harvey, who must load the ships, and a distributing manager at Cleveland in the person of Mr. Mills, who will direct their discharge by wire to the masters as they reach the Sault. While there are obvious difficulties in the way of new ideas in such an arrangement it may yet prove the best that can be devised to care for the immense interests involved.



Condition of the river from the town of St. Clair to the United States ship-canal.

ore, especially as the main line runs along the base of the Atikokan cliffs, but the Canadian Pacific will carry off the tonnage under a rate to Lake Superior of about 70 cents a gross ton. The ore deposits in this new district are a high grade magnetite and are very large.

A project for making a ship-canal between the Caspian and Black seas has recently been under consideration by the Russian hydrotechnical congress. The scheme has been revived because the industrial center of the Russian empire is shifting southward. The railways have not been able to keep pace with the growing industry in coal, iron and naphtha. The plan under consideration is to cut a canal 150 ft. wide and 22 ft. deep from Astrachan, at the mouth of the Volga on the western shore of the Caspian sea, to Rostov Roads on the Azoff.

Bertelsen & Petersen, marine engine and boiler builders of East Boston have taken a contract to build a new harbor tugboat for Capt. Haverly of Gloucester. The hull is under construction at the ship yard of A. D. Story of Essex, Mass., and will be ready about June 1. She will be 70 ft. long and will be equipped with a compound engine of 11 and 24 in. cylinder diameters and 16 in. stroke.

A dispatch from Copenhagen announces that the United Steamship Co. of that city has ordered six new steamers of 12,000 tons each for the United States trade. On account of the increase in American exports it has been decided to open a regular line to Boston and to increase the number of steamers on the New York and New Orleans route.

CO-OPERATION WITH THE WEATHER BUREAU.

Several articles of special interest on the great lakes have been secured from government officials by Capt. E. G. Ashley of Toledo, who has just finished the work of compiling the 1901 edition of the directory issued annually by the Ship Masters' Association. One of these is from Chief Willis L. Moore of the United States weather bureau. Prof. Moore says:

"I am always glad to contribute, so far as lies within my power, to the advancement of any organization that has for its object the betterment both socially and mentally of the men who navigate our lake waters. The thought that occurs to me at this moment and the one that I would like to bring to the attention of ship masters is not so much what the weather service is doing for the mariner on the great lakes, but how can the mariner best find out what is being done on his behalf? I am of opinion that a closer acquaintance between the men who command the ships and the men who distribute weather information would be mutually advantageous. The vessel captain is naturally averse to leaving his ship and in too many cases the weather bureau man remains closely housed in his office. There are good reasons why both classes of officials should, as a general proposition, remain at their respective posts of duty, yet it is only by personal contact and observation that we acquire a working knowledge of new ideas and methods. I should like to feel that every ship captain on the great lakes is familiar with the workings of the weather service, the information at its disposal, and the limitations that are naturally imposed on its forecasts and warnings. If any captain lacks this information I would urge him to take the first opportunity to visit a weather bureau office and thoroughly acquaint himself with the aim and scope of our work."

"The problem of how to widely disseminate storm warnings is one that has confronted each successive chief of the weather service since its organization thirty years ago. In the early days of the service many storm warnings were hoisted to moderate breezes. We have learned from the practice of our predecessors that too many warnings are almost as bad as none at all. The character of the vessels navigating the great

UNIFORMITY IN RULES OF THE ROAD.*

If I understand correctly its purposes, the Ship Masters' Association can at this time be a powerful agency in securing a most desirable improvement in the condition of navigation on the great lakes. When the revised international rules for preventing collisions at sea were about to be carried into effect, it was recognized that in several particulars those rules were not adapted to the navigation of the great lakes. Prompt action was needed to meet the situation. A delegation of twenty or more of the masters of lake steamships, accompanied by Harvey D. Goulder, Esq., of Cleveland, to whose intelligence, tact, and influence, the shipping interests of the great lakes are under many and heavy obligations, came to Washington. Within forty-eight hours these gentlemen, working day and night, drafted the "Rules of the Road" for the great lakes, which have come to be known as the "White Rules." The delegation appeared before committees of the senate and house, and so conclusive was the argument that the bill was reported and promptly passed without dissent and signed by the president on Feb. 8, 1895.

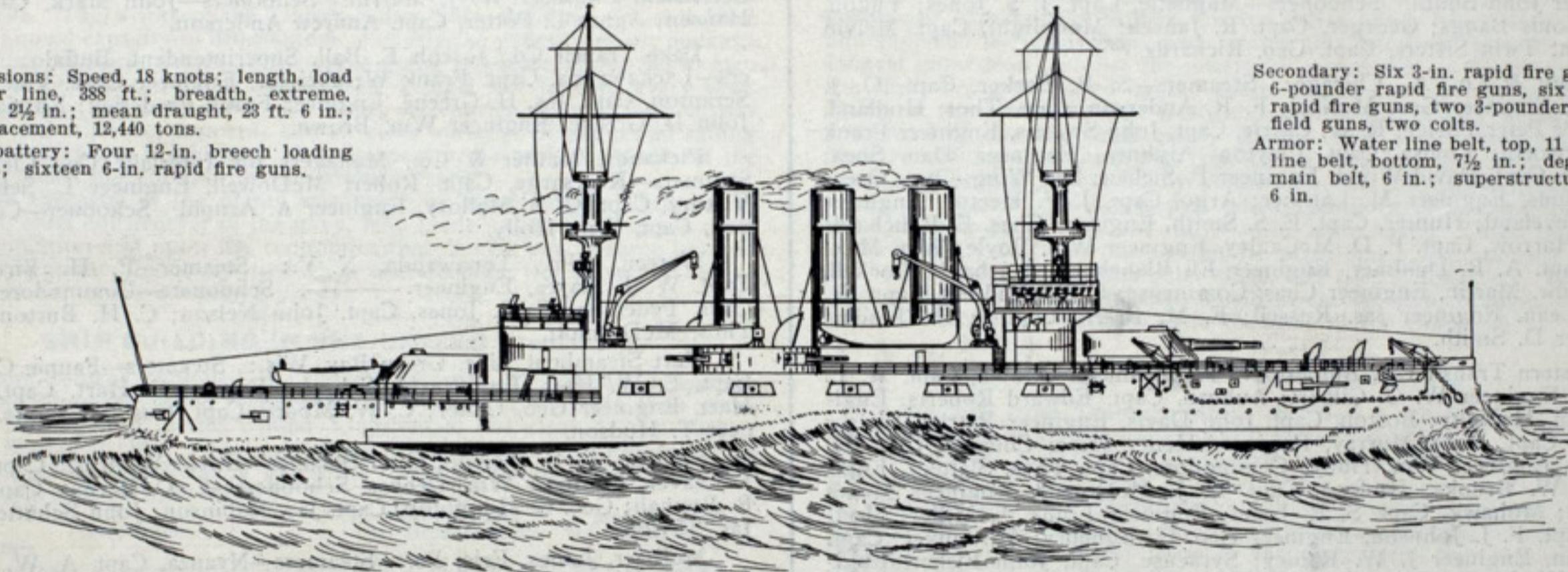
The necessity for uniform collision rules for American and Canadian vessels on the great lakes is obvious. Thus far our government has not been able to secure the assent of the Canadian government to the White rules. It is possible that in some quarters across the border there may be a little pique because our Canadian friends were not consulted before the White rules were enacted. Insufficient time before the adjournment of congress on March 4 was the only reason for this apparent lack of courtesy. Through your personal and professional affiliations with Canadian ship masters, the grand lodge ought now to be able to bring about that uniformity of American and Canadian regulations which all desire in the interest of safe navigation. Beyond question, Canadian masters can as surely and quickly convince the Canadian authorities of the desirability of the White rules, as the American masters convinced our congress.

Of all the delegations which have appeared before congress in the past seven years that delegation of lake masters was the most promptly

The Battleship Ohio to be launched at Union Iron Works, San Francisco, May 18.

Dimensions: Speed, 18 knots; length, load water line, 388 ft.; breadth, extreme, 72 ft. 2½ in.; mean draught, 23 ft. 6 in.; displacement, 12,440 tons.

Main battery: Four 12-in. breech loading rifles; sixteen 6-in. rapid fire guns.



lakes has, moreover, greatly changed, so that a storm that would have required a warning in the early days no longer hinders the full and free navigation of the lake waters.

"The means of communication between ship masters and officials on shore have not changed greatly within the last thirty years. Dependence is still placed on the display of flags and lanterns. When a severe storm is expected warning flags or lanterns which indicate the direction of the wind, as well as its force, are hoisted at certain points along the shore. It has been my privilege, under the direction of Secretary Wilson, to improve the facilities for displaying storm warnings at many points during the season which has just closed. I refer to the erection of steel warning towers surmounted by an iron flagstaff. These steel towers will be a permanent feature of the landscape and will make it comparatively easy for the masters to ascertain whether or not the weather bureau has information of importance for them. It is hoped to continue the erection of these steel warning towers until all important lake ports have been supplied.

"When a master first observes a warning flag or lantern it should be his duty to inquire at the port at which the warning is displayed as to the location and nature of the disturbance. In many cases it will be found safe for masters of seaworthy vessels, being forearmed by a knowledge of the expected force and direction of the winds, to proceed. He should not, however, on his own responsibility proceed in ignorance of the probable weather conditions that are likely to overtake him. The daily forecasts of the expected force and direction of the wind are supplied to all vessels passing Detroit and Sault Ste. Marie. These two points are so situated that vessel masters can with little or no inconvenience ascertain the weather conditions in all portions of the lake region. During the coming season of navigation a report of the direction and force of the wind at the Straits of Mackinac will be added.

"The rapid increase in the number of telephones in use at the larger lake ports makes it a comparatively easy matter to communicate orally with weather bureau officials. I would especially urge masters of all vessels in all cases when the weather is threatening or where storm warnings have been hoisted to make direct inquiry at the nearest weather bureau office as to the probable force of the storm and the direction of its movement."

The torpedo boat Barney, built by the Bath Iron Works, Bath, Me., on her preliminary trial trip last week made 29.3 knots. The contract required 28 knots per hour.

Secondary: Six 3-in. rapid fire guns, eight 6-pounder rapid fire guns, six 1-pounder rapid fire guns, two 3-pounder rapid fire field guns, two colts.

Armor: Water line belt, top, 11 in.; water line belt, bottom, 7½ in.; degree above main belt, 6 in.; superstructure armor, 6 in.

and signally successful. I well recall the remark of the chairman of the senate commerce committee, the Hon. William P. Frye of Maine, the most earnest and far-sighted friend American shipping interests have had in this generation, as the delegation left the room: "What a splendid body of men! If we had such earnestness and unity of purpose as they show, among our shipping people on the seaboard, it would not take long to arouse congress to the needs of an American merchant marine on the oceans as well as on the lakes."

*A letter from Mr. E. T. Chamberlain, United States commissioner of navigation, in the 1901 edition of the Ship Masters' Association directory, compiled by E. G. Ashley, secretary, Toledo, O.

IMPROVEMENT OF CANADIAN WATERWAYS.

The Canadian government is taking active steps to improve the waterways and seaports of the dominion. The St. Lawrence route is receiving much attention and discussion, both in parliament and in the daily press. There is a unanimous feeling that the increased demands of modern shipping must be met by deeper and larger channels and a more perfect system of lights and buoys, and large appropriations have been voted. About twelve years ago, the St. Lawrence ship-channel from Montreal to the sea was completed to a depth of 27 ft. at low water, and a minimum width of 300 ft. It is now being deepened to 30 ft. and widened to 450 ft. and there is talk of 35 ft. and 600 ft. The total length of dredged channel is about 50 miles. The work is mostly done by the government, and they are now adding several large high-powered modern dredges to their fleet, and remodeling the government ship-yard at Sorel, Que., by the addition of steel buildings and new tools. This is mainly due to the progressive policy of Mr. Tarte, the minister of public works, and these additions are being made under the engineering guidance of Mr. A. W. Robinson, member of the American Society of Civil Engineers. Two large steel-hulled dredges are now being built from Mr. Robinson's designs—one for British Columbia and the other for the St. Lawrence. Mr. Robinson has also been commissioned to examine the seaport channels in Nova Scotia and New Brunswick with a view to designing a large self-propelling dredge to suit the conditions there existing.

The Philadelphia Transatlantic line was incorporated with a capital of \$2,500,000 at Trenton, N. J., last week for the purpose of constructing and operating steamships. The incorporators are Frederick Walter Taylor, Joseph Sterling Taylor and John F. Lewis, all of Philadelphia.

MASTERS AND ENGINEERS OF LAKE VESSELS.

Gilchrist, J. C., Cleveland: Steamers—City of Genoa, Capt. Chas. Hahn, Engineer John Fritz; City of Naples, Capt. F. A. Goodell, Engineer John Mahr; City of Rome, Capt. H. G. Hayberger, Engineer Charles Martin; John Craig, Capt. W. H. Landgraff, Engineer John Galan; Cumberland, Capt. F. Heaton, Engineer Warren Welch; Columbia, Capt. M. J. Madden, Engineer Thomas Burns; Colonial, Capt. F. Chilson, Engineer Geo. Masters; C. W. Elphicke, Capt. J. A. Michelson, Engineer Charles Sharp; C. A. Eddy, Capt. C. C. Balfour, Engineer C. J. Erickson; Gilchrist, Capt. C. T. Gunderson, Engineer Henry Jesson; J. C. Gilchrist, Capt. Geo. Bartholomew, Engineer R. H. Reynolds; John Harper, Capt. A. Ames, Engineer C. Clarke; Helena, Capt. W. E. Wright, Engineer Chris Howard; Hiawatha, Capt. Alva Keller, Engineer Lester Hineline; Jupiter, Capt. F. A. Graves, Engineer Ed. Reilly; Mars, Capt. J. C. Byers, Engineer John Seymour; Marquette, Capt. E. A. Chilson, Engineer Stewart Brant; Uranus, Capt. W. G. Stewart, Engineer A. F. Hogle; Neptune, Capt. B. Moshier, Engineer John Parks; Saturn, Capt. J. P. Minakey, Engineer Joseph Birney; Venus, Capt. W. C. Butts, Engineer Chas. Gumlick; Lake Shore, Capt. W. Blattner, Engineer C. N. Albee; C. B. Lockwood, Capt. J. C. Dobson, Engineer W. H. Pinkham; Lansing, Capt. W. G. Rogers, Engineer E. Harris; Massachusetts, Capt. Geo. Guddsbach, Engineer Harry Barden; Manhattan, Capt. Claud Ennes, Engineer H. F. Hawthorne; Merrimac, Capt. C. Saph, Engineer Frank Oullette; Alex. Nimick, Capt. T. D. Gibson, Engineer Burt Beauchamp; Neshoto, Capt. E. L. Ennis, Engineer Jas. S. Balfour; Neosho, Capt. R. J. Walder, Engineer William Tyler; Olympia, Capt. A. M. Sheppard, Engineer Peter Lamar; R. E. Schuck, Capt. F. H. Reid, Engineer Peter Shackett; Sitka, Capt. Alex. Forbes, Engineer P. F. Burch; Siberia, Capt. John McDonald, Engineer Burrows; V. Swain, Capt. J. B. Lyons, Engineer _____; C. Tower, Capt. Pete Full, Engineer W. T. Schwacofer; Tacoma, Capt. Trotter, Engineer James Hyde; Volunteer, Capt. Wilson McGregor, Engineer R. D. Mayberry; A. P. Wright, Capt. M. H. Clark, Engineer Geo. Zanger; Geo. F. Williams, Capt. T. C. Ellis, Engineer Robert Buchanan; Wallula, Capt. S. E. Philip, Engineer Jacob Zeh; D. C. Whitney, Capt. Thos. J. Carney, Engineer Chas. Murett; Waverly, Capt. D. Kirby, Engineer John McGregor; Yakima, Capt. E. R. Morton, Engineer John Smith. Schooners—Magnetic, Capt. J. S. Jones; Yukon, Capt. Louis Bangs; Georger, Capt. R. Jansen; Moonlight, Capt. Melvin Simpson; Twin Sisters, Capt. Geo. Richards.

Booth & Co., A., Chicago: Steamers—S. B. Barker, Capt. O. J. Vorous, Engineer Geo. McNeal; F. R. Anderson, Capt. Thos. Hodland, Engineer Peter Pfister; R. W. Currie, Capt. John Swanas, Engineer Frank Cumberworth; Lovisa, Capt. Clayton Aighmy, Engineer Dan Shea; Duchess, Capt. David Wood, Engineer P. Sicken; Sea Wing, Capt. Oscar Cornelius, Engineer M. Latimer; Argo, Capt. J. F. Hector, Engineer E. S. Cleveland; Hunter, Capt. E. S. Smith, Engineer Chas. E. Bouchard; W. G. Harrow, Capt. P. D. McCauley, Engineer Wm. Boyle; Wm. Maxwell, Capt. A. B. Dahlmer, Engineer Eli Blanchard; Bertha L. Cockell, Capt. Edw. Martin, Engineer Chas. Commense; C. W. Endress, Capt. W. B. McLean, Engineer Jas. Russell; E. M. B. A., Capt. J. H. Troden, Engineer D. Smith.

Western Transit Co., Buffalo, N. Y.: Steamers—Arabia, Capt. H. L. Dennis, Engineer W. C. Gilbert; Auburn, Capt. Edward Roberts, Engineer Wm. McNulty; Boston, Capt. John Davis, Engineer Patrick Welsh; Buffalo, Capt. Robt. Murray, Engineer Henry Hess; Chicago, Capt. H. Murphy, Engineer Wm. Tibby; Commodore, Capt. Thos. Slattery, Engineer J. W. Brooks; Hudson, Capt. A. J. McDonald, Engineer Moses Trouton; Mohawk, Capt. S. R. Jones, Engineer Frank A. Miller; Montana, Capt. F. J. Johnson, Engineer Geo. H. Blinebry; Milwaukee, Capt. M. Folan, Engineer J. W. Rainey; Syracuse, Capt. John Fisher, Engineer J. W. Mark; Troy, Capt. Donald Gillies, Engineer M. J. Laney; Vanderbilt, Capt. F. D. Osborn, Engineer F. W. Hale.

Hines Lumber Co., Edward, Chicago: Steamers—Santa Maria, Capt. S. B. McCann, Engineer J. Blauvett; S. S. Wilhelm, Capt. Wm. Roach, Engineer _____; Louis Pahlow, Capt. Jas. Carr, Engineer U. O. Helmholz; Oscoda, Capt. Wm. Disher, Engineer F. Nold; Cormorant, Capt. Ino. Milne, Engineer C. E. Redner; J. Watson Stevenson, Capt. Daniel Wall, Engineer Jos. Nold; Normandie, Capt. Wm. Ingalls, Engineer _____. Schooners—S. E. Marvin, Capt. C. K. Moore; Wayne, Capt. Eli Jacques; Nirvana, Capt. John Hudson; Galatea, Capt. A. Germain; City of Chicago, Capt. Fred Anderson; Delta, Capt. John Bates; D. L. Filer, Capt. J. Jennings; Ida Corning, Capt. P. Edgar; Alice B. Norris, Capt. Horace Acres.

Rutland Transit Co., J. G. Westbrook, Gen. Supt., Ogdensburg, N. Y.: Steamers—W. L. Frost, Capt. W. H. Plumb, Engineer A. J. Kinch; W. J. Averill, Capt. T. M. Hough, Engineer H. M. Burton; W. A. Haskell, Capt. E. B. Shay, Engineer L. O. Willix; Gov. Smith, Capt. W. S. Shay, Engineer John N. Phillips; J. A. Langdon, Capt. Harvey Brown, Engineer Jas. Chestnut; A. McVittie, Capt. W. D. Wait, Engineer D. G. Costello; F. H. Prince, Capt. D. Kiah, Engineer John Alexander; H. R. James, Capt. Jas. Owens, Engineer Jas. Turnbull.

Ogdensburg Coal & Towing Co., Ogdensburg, N. Y.: Tugs—Geo. D. Seymour, Capt. Geo. Clifford, Engineer Thos. Grady; Myra, Capt. Jas. Martin, Engineer N. T. Jento. Schooners—Henry Witbeck, Capt. J. Mallette; Menominee, Capt. Jas. Brackin; Isaac Stephenson, Capt. Adelor Demero; Fred Carney, Capt. Timothy Hunt; Hoboken, Capt. Jas. Keran; L. S. Hammond, Capt. O. C. Wilcox; H. B., Capt. M. Rodrique; Jas. Buckley, Capt. N. Lalonde; Ireland, Capt. Louis Sauve; Aid, Capt. N. Gamelin; England, Capt. Justin Mallett, Jr.

Hall Coal Co., Geo., Ogdensburg, N. Y.: Steamer—Hecla, Capt. Daniel Houdigan, Engineer Daniel Doyle. Schooners—W. A. Sherman, Capt. Mathew Houdigan; Bolivia, Capt. Jos. Goodwin; E. P. Beals, Capt. Louis Dion; Jennie Mathews, Capt. F. D. Lamb; Mary Lyon, Capt. T. LaFlam; Black Diamond, Capt. I. Glode; Argosy, Capt. John Gokey; Mohawk, Capt. P. P. Leon; Onondaga, Capt. Geo. Fournier; Thrush, Capt. I. Brunett; Lapwing, Capt. Jos. Ledue; Hiawatha, Capt. L. Vernier.

Northern Navigation Co. of Ontario, Ltd., Collingwood, Ont.: Steamers—Majestic, Capt. P. M. Campbell, Engineer W. Aston; Collingwood, Capt. J. Bassett, Engineer C. Robertson; Germanic, Capt. Robt. Foote, Engineer Joe Aston; Atlantic, Capt. Wilson, Engineer Fred Cle-

land; Midland, Capt. E. Walton, Engineer W. Whipps; Britannic, Capt. Jaques, Engineer Wm. Beatty; Toronto, Capt. Cameron, Engineer Wm. Harman.

Lake Champlain Trans. Co., Whitehall, N. Y.: Steamers—Robert H. Cook, Capt. Geo. N. Sweeney, Engineer Peter Blett; J. G. Witherbee, Capt. Peter Dionne, Engineer John Guyette; H. G. Tisdale, Capt. A. Murray, Engineer Peter Matt; Germania, Capt. O. Lafountain, Engineer Ed. Gordon; Burleigh, Capt. E. M. Rockwell, Engineer J. Prowst; Defender, Capt. Geo. Joy, Engineer Jos. Arquette.

Gilchrist, F. W., Alpena, Mich.: Steamers—S. C. Hall, Capt. H. L. Foster, Engineer Wm. Hamilton; Norseman, Capt. H. Bennett, Engineer Harry Parker; Viking, Capt. H. Richardson, Engineer S. Richards. Schooners—Vinland, Capt. Thos. Stephens; N. Mason, Capt. J. B. Mitchel; Sam Flint, Capt. H. G. Hamilton; Russian, Capt. Jos. Hamilton; J. B. Kitchen, Capt. B. McCaffery.

Smith, Edward, Buffalo: Steamers—Samuel Marshall, Capt. Aug. Jean, Engineer Philip Asend; Samoa, Capt. John Isbester, Engineer Joseph Velley; City of Paris, Capt. E. D. Ballentine, Engineer James McDougall; City of Venice, Capt. Philip Broderick, Engineer W. N. McDougall; Thos. Cranage, Capt. John S. McNeil, Engineer Jos. Blanchard.

D. C. Whitney, Detroit: Steamers—David M. Whitney, Capt. John Ivers, Engineer Chas. Francomb; E. W. Oglebay, Capt. W. H. Hutchison, Engineer Thos. Francomb; Merida, Capt. A. C. May, Engineer E. Egan; Mecosta, Capt. Chas. Miner, Engineer _____; Nipigon, Capt. J. Mara, Engineer John Lolean. Schooner—Melbourne, Capt. Geo. Cooper.

Owen, Geo., Ashtabula, O.: Steamers—Janie E. Smith, Capt. F. E. Nettleson, Engineer Henry Hess; Jennie Hayes, Capt. D. W. Nettleson, Engineer John Mahony; L. W. Knapp, Capt. A. C. Snell, Engineer Peter Rasmussen; Neal H. Dow, Capt. Clyde Jones, Engineer _____.

Nessen & Co., J. O., Manistee, Mich.: Steamers—F. W. Fletcher, Capt. H. Bennett, Engineer Geo. Hopkins; Chas. Rietz, Capt. Jacob Berentsen, Engineer W. J. Merrill. Schooners—John Mark, Capt. Ed. Hansen; Agnes L. Potter, Capt. Andrew Anderson.

Lake Transit Co., Joseph E. Ball, Superintendent, Buffalo: Steamers—Lackawanna, Capt. Frank Weinheimer, Engineer Chas. Van Every; Scranton, Capt. Jas. H. Greene, Engineer Frank Frederick; Russia, Capt. John D. Greene, Engineer Wm. Brown.

Pickands, Mather & Co., Managers for Interlake Co., Cleveland: Steamers—Kearsarge, Capt. Robert McDowell, Engineer L. Sebastian; Victory, Capt. G. B. Mallory, Engineer A. Arnold. Schooner—Constitution, Capt. Wm. Holly.

Warren, Wm., Tonawanda, N. Y.: Steamer—P. H. Birckhead, Capt. W. J. Hayes, Engineer _____ Schooners—Commodore, Capt. Chas. Pederson; C. B. Jones, Capt. John Nelson; C. H. Burton, Capt. Thos. McDermott.

Hart Steamboat Line, Green Bay, Wis.: Steamers—Fannie C. Hart, Capt. E. W. Hart, Engineer J. Schram; Eugene C. Hart, Capt. C. B. Hart, Engineer Geo. Colter; C. W. Moore, Capt. Gus LaCompte, Engineer T. Hudson.

Sullivan, L. S., Toledo, O.: Steamer—David W. Rust, Capt. Wm. J. Leaver, Engineer Wm. Decker. Schooners—C. C. Barnes, Capt. Geo. R. Bonnah; Geo. G. Houghton, Capt. Jas. Robinson; John Schutte, Capt. Jas. Taylor.

McBrier, James, Erie, Pa.: Steamers—Nyanza, Capt. A. W. White, Engineer W. J. McDonald; Uganda, Capt. W. W. Wilkins, Engineer M. J. McAuliffe; Sevona, Capt. D. S. McDonald, Engineer Wm. Phillipi.

Pickands, Mather & Co., Managers for Boston Coal Dock & Wharf Co., Cleveland: Steamer Appamattox, Capt. Hugh Stevenson, Engineer H. A. Woods. Schooner—Santiago, Capt. F. Hebner.

Northern Michigan Transportation Co., Chicago: Steamers—Illinois, Capt. Wm. Finucan, Engineer Thomas Collins; City of Charlevoix, Capt. Peter McGuigan, Engineer J. W. Myers.

Parker, G. W., Marine City, Mich.: Steamer—D. F. Rose, Capt. Jos. Flaherty, Engineer Herbert Marrion. Schooners—Boscobel, Capt. A. J. Young; Marine City, Capt. Jos. Rose.

Pickands, Mather & Co., Managers for Huron Barge Co., Cleveland: Steamer—Pathfinder, Capt. D. H. Mallory, Engineer J. Tebeau. Schooner—Sagamore, Capt. E. C. Joiner.

Sharp, W. H., Bay City, Mich.: Steamer—J. P. Donaldson, Capt. Jas. Conally, Engineer John Fettig. Schooner—Wright, Capt. Thos. Thorkildsen.

Marine Transit Co., Marine City, Mich.: Steamer—Toltec, Capt. Jas. Taylor, Engineer Ames Horton. Schooner—Zapotec, Capt. Peter Thomson.

Hawgood, Wm. A., Cleveland: Steamer—Iosco, Capt. Jas. Owen, Engineer John Chapman. Schooner—Olive Jeanette, Capt. D. B. Cadotte.

Neville, Richard, Managing Owner, Cleveland: Steamer—R. R. Rhodes, Capt. Wm. Humphrey, Engineer Wm. Huber.

Argo Steamship Co., E. L. Fisher, Mgr., Cleveland: Steamer—Argo, Capt. Geo. L. Cotrell, Engineer John Golden.

Chapman, Frank, Ogdensburg, N. Y.: Steamer—John Rugee, Capt. Richard Fitzgerald, Engineer Hugh Goodheart.

Hill, L. P., Managing Owner, Wonewoc, Wis.: Steamer—Cecilia Hill, Capt. L. L. Hill, Engineer Orin Rowin.

Carleton, Eugene M., Cleveland: Steamer—H. D. Coffinberry, Capt. Wm. Ferguson, Engineer Herbert Frazer.

Hawgood, Henry A., Cleveland: Steamer—S. S. Curry, Capt. Geo. Rowbarger; Engineer Geo. B. Wilson.

White, Wm. H., Boyne City, Mich.: Steamer—John Spry, Capt. Gus Gunderson, Engineer _____.

Hurd & Hauenstein, Buffalo: Steamer—Wotan, Capt. Frank F. Kinyon, Engineer Mike Owen.

SEABOARD SHIP YARD CONSOLIDATION.

H. W. Poor & Co., New York, have issued a circular outlining the plan of consolidating various seaboard ship yards. The new company, which is to be organized under the laws of New Jersey with a capital stock of \$65,000,000 and called the United States Ship Building Co., will acquire the plants and equipment of the following companies: The Newport News Ship Building & Dry Dock Co., Newport News, Va.; the Union Iron Works, San Francisco, Cal.; the Bath Iron Works, Ltd., and the Hyde Windlass Co., Bath, Me.; Lewis Nixon's Crescent Ship Yard, Elizabethport, N. J.; Samuel L. Moore & Sons Co., Elizabethport, N. J.; and the Canda Manufacturing Co., Carteret, N. J. The board of directors is as follows: Henry T. Scott, president of the Union Iron Works; Lewis Nixon, Crescent Ship Yard; Charles J. Canda, president of the Canda Manufacturing Co.; John S. Hyde, president of the Hyde Windlass Co.; E. W. Hyde, president of the Bath Iron Works, Ltd.; E. H. Harriman, chairman of board, Union Pacific Railroad Co.; H. E. Huntington, first vice-president of the Southern Pacific Co.; Irving M. Scott, vice-president and general manager of the Union Iron Works; C. B. Orcutt, president of the Newport News Ship Building & Dry Dock Co.; Edwin Hawley, president of the Minneapolis & St. Louis Railway Co., and James Stillman, president of the National City Bank.

There is to be \$32,500,000 7 per cent. non-cumulative preferred stock and \$32,500,000 common stock, all of which will be issued and delivered to the Mercantile Trust Co. as depository as soon as the company is organized. For the purpose of carrying out the above plan H. W. Poor & Co. will receive subscriptions for \$20,000,000 preferred stock at par, with an equal amount of common stock.

The aggregate of the orders now placed with the constituent companies is for more than \$63,000,000 worth of work, which will require an average of eighteen months for completion and upon which the estimated profit will be over \$7,000,000. With that as a basis, the organizers of the new trust estimate that the future annual net earnings will average about \$6,000,000, or enough for 7 per cent. dividends on the preferred and 6 per cent. on the common stock and a substantial surplus.

It is said that the constituent companies will be taken over with adequate working capital and free from debt, so the profits to accrue on the contracts already secured, according to the circular, will be available for dividends. The works of the United States Ship Building Co. will have a total annual capacity of 380,000 tons, exclusive of general repair, dockage and collateral work. With all the yards going full blast, about 24,000 men will be employed and about 275,000 tons of steel will be used every year. The company will have the power under its charter to build war vessels for this and other governments and all other varieties of steam and sailing craft and auxiliary machinery. It will operate the only dry dock on the Atlantic coast big enough for the largest vessels.

The appraisal of the plants was made by Rear Admiral Francis T. Bowles, chief constructor of the navy, who made exhaustive reports upon their condition and upon the economies that can be put in force in their joint operation. It is reported that Mr. Bowles will have the active management of the combined plants.

SHIP BUILDING IN THE UNITED KINGDOM.

From returns compiled by Lloyd's register of shipping it appears that, excluding warships, there were 444 vessels of 1,303,116 tons gross under construction in the United Kingdom at the close of the quarter ended March 31, 1901. The particulars of the vessels in question are as follows, similar details being given for the corresponding period in 1900 for the purpose of comparison:

Description.	March 31, 1901.		March 31, 1900.	
	No.	Gross tonnage.	No.	Gross tonnage.
Steam—				
Steel	410	1,293,071	459	1,238,555
Iron	1	190	49	9,564
Wood and Composite	4	902	3	980
Total	415	1,294,163	511	1,249,099
Sail—				
Steel	9	7,120	16	8,350
Iron	20	1,833	27	2,973
Total	29	8,953	43	11,323
Total Steam and Sail	444	1,303,116	554	1,260,422

The present returns show an increase in the tonnage under construction of about 33,000 tons as compared with the figures for last quarter. As compared with the return for December, 1898, which is the highest on record, there is a reduction of 98,000 tons. The number of warships under construction in Great Britain during the quarter is sixty-four, with a total tonnage of 423,702 tons.

VESSELS BUILT DURING APRIL.

The bureau of navigation reports 128 vessels of 63,159 gross tons were built in the United States and officially numbered during the month of April, 1901, as follows:

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
Atlantic and Gulf	38	5,472	30	1,695	5	13,998	68	21,165		
Pacific	10	3,077	21	1,098	1	23	32	4,198		
Great Lakes		8	1,570	2	4,558	9	30,324	14	36,452	
Western Rivers	4	70	10	1,274					14	1,344
Total	47	8,619	64	5,637	2	4,558	15	44,345	128	63,159

The gross tonnage of vessels built during April 1900 was 35,967.

Mr. H. F. J. Porter, formerly manager of the Chicago office of the Bethlehem Steel Co., and more recently located at the works at South Bethlehem, has been appointed New York sales agent of the company, with headquarters at 100 Broadway.

ENGLISH DESCRIPTION OF SHAMROCK II.

The Daily Telegraph, London, publishes the following description of the new cup challenger Shamrock II.

"What is the new challenger like, then? There have been many guesses at the truth, especially in American papers. Mr. Watson avers that he knows no imaginative effort like these speculations since the writing of the 'Arabian Nights.' Generally Shamrock II has the appearance of an officer's cocked hat upside-down, but the two pontoons, between which the deep keel dropped, somewhat spoilt the illusion. In yachting phrase she has the sweetest lines and the easiest form of any craft hitherto built in this country. Her general look indicated that the deck plan had been spread forward and then drawn in in a full curve to a bow, snubbed off abruptly with two hawseholes of copper, one on each side of the bowsprit. This is well supported by lateral spreaders, and the bobstay secured by a nipple so as to offer the least resistance. This portion of the previous challenger was its weakest, and the experience has been laid to heart. From the bow the lines drop away in an easy curve, so as to minimize to the greatest extent all resistance of the water, and this is also the characteristic of her after part. She is planned to skim the water, as a water bird does, instead of cutting through it in the old-fashioned style, once regarded as an essential feature. In appearance, from the top of the fin to the wakeline, her hull is a gentle curve devoid of any harsh angles, and has something of the appearance of the forepart of a tablespoon. While she bears some resemblance to the Columbia, last year's defender of the cherished trophy, the transition from the hull to the fin is sweeter and far easier than in the first Shamrock. The same graceful characteristics mark the afterpart of the yacht, and from bow to stern she has not a suggestion of an angle.

"Pleasing as are her lines even in the plans, their graceful, gentle curves have been accentuated by the beautiful workmanship of her builders. Poised between the two pontoons she resembled some finely wrought and skilfully burnished jewel. The effect has been produced by the use of manganese bronze from the keel to the rails. This alloy has been found to give a smoother surface than any other composition, and does not foul or become affected by the action of salt water, while it gives greater strength for the same weight than aluminum, with which the new Shamrock's predecessor was plated. The latter metal is also liable to corrosion. Manganese bronze, on the other hand, has a face as clean and polished as plate glass, and retains this excellent feature after the longest immersion. Hence the jewel-like appearance of the Shamrock II, the effect being increased by the skilful use of flush rivets and the close fitting of the joints, so that from end to end the plating appears to be composed of one big sheet gently curved to fit the nickel-steel frames. To give additional strength and rigidity the deck has been made of aluminum, and is thinly covered by yellow pine for the convenience of her crew. Of course, the day is past when racing yacht constructors could put California pine in such a craft for the main spars. Those of the new challenger are built on more scientific principles. They consist of light steel plates bent to a semicircular shape and riveted together. The mainmast is thus fashioned, and into it will fit the wooden topmast, so that it can be telescoped if desired, as in the case of the Columbia."

TRIAL TEST OF SHAMROCK II.

A dispatch from Southampton to the New York Sun thus describes the trial test between Shamrock I and Shamrock II:

The feature of the trial between the Shamrocks was the opportunity given to make a comparison to some extent of the two boats. In going to windward they were purposely kept some distance apart, but the space between them was not wide enough to prevent a judgment on their merits. Shamrock I is undoubtedly faster in her altered trim than she was before and she held the challenger down the wind while the breeze was lightest. Shamrock II suffered here from her smaller and badly setting gaff topsail. The new challenger's superiority, however, in reaching, sailing close hauled and in beating was most marked. She seemed to be capable of sailing around Shamrock I. The latter stood up the better of the two in the hardest of the breeze, and while there was little difference in the quantity of broken water at their bows the new boat cast smoother water from her quarters. At the close of the run back, which was so slow owing to want of wind that it took two hours to sail five miles against a strong ebb tide, Shamrock II gained rapidly, and getting by the wind at the entrance of Southampton water, she raced fast on the weather side of the Fife boat, passing her easily, and kept ahead with checked sheets during the remainder of the fetch to the anchorage off Hythe.

Mr. Watson was not on board Shamrock II. Sir Thomas Lipton was delighted with his new boat's performance, and he was ready to let it be known that his confidence in her is growing. Sailmaker Ratsey says she is absolutely the most perfect yacht on this side of the Atlantic. He believes there should be seconds only dividing the two contestants in the international races. Capt. Sycamore, although he was judiciously reticent, did not conceal the fact that he was highly pleased with the boat.

Mr. Jameson was quite elated, and, with Sir Thomas Lipton, believes that the chances of the British boat "lifting" the cup are much better than on any former occasion. Shamrock II will go out again in a few days, with Messrs. Watson and Fife on board, when there will be another informal trial with Shamrock I and a testing of the challenger's running gear. The actual contest, which is set for Saturday of this week, may perhaps be postponed until Monday. It is believed that the accurate sail area of Shamrock II is 14,800 sq. ft.

Shipping circles in New York are inclined to the belief that the Morgan interests will eventually cause the consolidation of the newly purchased Leyland line with the American, Red Star and Atlantic Transport lines. The report of the amalgamation has been persistent for more than six months.

The Pan-American exposition at Buffalo opens May 1, 1901, and don't forget that the Nickel Plate road is the shortest and most expedient route to Buffalo and will land you directly at the exposition gates. Rates are in effect April 30, 1901, and good going or returning on any of our trio of daily express trains. Write, wire, phone, or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O.

No. 37 June 1.

INDEPENDENT STEEL INTERESTS.

A LIST OF FORMIDABLE COMPANIES WHICH ARE NOT INCLUDED IN THE UNITED STATES STEEL CORPORATION—THEY ARE BY NO MEANS A SMALL FACTOR IN THE IRON AND STEEL INDUSTRY.

The impression is general among the laymen that the United States Steel Corporation controls absolutely the production of iron and steel in the United States; but the impression is far from the truth. There is a formidable array of steel making companies outside of the corporation, the enumeration of which will convince anyone that the Steel Corporation is by no means entirely in control of the making of steel in the United States. The corporation possesses, however, in its Lake Superior properties, a very large part of the known iron ore deposits of the United States and enjoys unusual facilities for getting the raw material to the furnaces cheaply. In this lies its great advantage. The principal companies outside of the corporation are as follows:

Alabama Consolidated Coal & Iron Co.—The authorized capital stock of this company is \$5,000,000, divided equally into common and preferred, the preferred stock bearing 7 per cent. cumulative. All the stock has been issued and the company has no bonded indebtedness. Since Nov. 1, 1899, dividends have been declared regularly. The properties and plants owned by this company include several blast furnaces in Alabama and thousands of acres of ore lands in Alabama and Georgia. The company produces 150,000 tons of iron a year and 35,000 tons of coal a month.

American Car and Foundry Co., with headquarters at St. Louis.—The authorized capital stock of this company is \$60,000,000, of which \$30,000,000 is common and \$30,000,000 is preferred. It has no bonded indebtedness. Of the total authorized issue of the stock, \$29,000,000 of each kind has been issued. The company controls fourteen plants for the manufacture of cars and car parts. The company can turn out 500 passenger cars a year, 90,000 freight cars, 900,000 car wheels, 30,000 tons of cast iron pipe, 90,000 tons of bar iron and axles and 130,000 tons of casting.

American Iron & Steel Manufacturing Co.—This company has an authorized capital of \$20,000,000. Of this \$3,000,000 is preferred and \$17,000,000 is common. All the preferred stock has been issued and \$1,700,000 of the common stock. The preferred stock paid 1 1/4 per cent. quarterly during 1900 and the common stock also paid dividends. The company's products are bar iron and steel, machine bolts, carriage bolts, nuts, washers, railway and dock spikes, car forgings and rods and irons for bridges and buildings. All of the company's plants are in Lebanon, Pa.

Bethlehem Steel Co., whose capital stock is \$15,000,000 of common shares, all issued. This company's plant is the plant of the Bethlehem Iron Co. at Bethlehem, Pa., and its products are pig iron, steel bars and billets, forgings, guns and armor plate. Of pig iron the company turns out 150,000 tons a year, of bars and billets 40,000 tons, of forgings 50,000, 000 pounds and of armor plate 6,000 tons a year.

Cambria Steel Co., whose capital stock is \$16,000,000, all of which is outstanding, and besides this there is an outstanding bonded indebtedness of \$218,200. This company owns or controls six plants in Pennsylvania and turns out steel rails, bolts, bars and nuts, billets, forgings, structural steel and parts for cars and locomotives, as well as agricultural implements and shafting. The company produces 500,000 tons of the finished product annually.

Central Foundry Co., which controls twenty-five plants in New York state, in Maryland, Pennsylvania, Delaware, Illinois, Wisconsin, Alabama, Indiana, Tennessee, Ohio and Kentucky. The capital stock of this company is \$14,000,000, divided into \$7,000,000 of 7 per cent. cumulative preferred stock and \$7,000,000 of common stock, all of which is issued and outstanding. Besides the stock issued, the company has a bonded indebtedness of \$4,000,000, the bonds bearing interest at 6 per cent. No dividends on either the common or the preferred stock have yet been declared. The company manufactures soil pipe and soil pipe fittings and plumbers' cast iron goods. The productive capacity of the various plants is from ten tons to seventy-five tons of the finished product a day.

Colorado Fuel & Iron Co., which owns steel works, rolling mills, iron mines, coal mines, coke ovens and railroad properties in Colorado, Wyoming and New Mexico. The authorized capital stock of this company is \$25,000,000, divided into \$2,000,000 of preferred and \$23,000,000 of common. All the preferred stock has been issued, as well as \$17,000,000 of the common. The company has a bonded indebtedness of \$7,623,000. Since June 30, 1900, a dividend of 8 per cent. per annum has been declared semi-annually on the preferred stock. One dividend has been declared on the common stock. The company mines 5,000,000 tons of coal per annum and makes 700,000 tons of coke. It manufactures 400 tons of pig iron daily, 225 tons of spiegel, 700 tons of blooms, slabs and billets, 700 tons of steel rails and fastenings, 140 tons of structural and plate steel, 160 tons of bolts and spikes, 40 tons of pipe bands, 275 tons of steel bars, and 40 tons of cast iron water and gas pipe.

Crucible Steel Company of America, which controls thirteen plants in the Pittsburg district of Pennsylvania, at Jersey City and Harrison, N. J., at Cumberland, Md., and Portsmouth, Ohio. The authorized capital stock of the company is \$50,000,000, divided equally into common and preferred. Of the preferred stock \$24,399,500 has been issued and \$24,410,900 of the common. The company has no bonded indebtedness and since its organization on July 21, 1900, it has paid 1 1/4 per cent. on the preferred stock. The products of the company are crucible, open-hearth and bessemer steel, copper, steel springs, agricultural implement steel and track tools. The productive capacity of this company is 300,000 tons a year.

Diamond State Steel Co., which owns the plant of the Diamond State Iron Co. at Wilmington, Del., and a new open-hearth steel plant, consisting of five fifty-ton furnaces and a blooming mill, with forty acres of land on tidewater at Wilmington. The capital stock of this company is \$3,000,000, with no bonded indebtedness. The stock is all common, and regular dividends of 4 per cent. have been declared on it. The company makes steel billets, splice bars, track bolts, spikes, ordinary bolts and nuts, washers, rivets, horseshoe iron, horseshoes, forgings and castings; and manufactures 135,000 tons of open-hearth steel a year and 600,000 tons of finished iron and steel.

Empire Iron & Steel Co., which controls eighteen properties in New

Jersey, Pennsylvania, North Carolina and Virginia. The authorized capital stock of the company is \$10,000,000, divided equally into common and preferred, the preferred bearing 6 per cent. cumulative interest. Of the authorized stock, \$2,368,100 of the preferred stock has been issued and \$2,281,400 of the common is outstanding. The company has no bonded indebtedness and has paid its dividends on its preferred stock. No dividend has yet been declared on the common stock, but the company has a surplus of \$488,835.50. The plants turn out 1,000 tons a day of pig iron, bessemer steel, foundry and forge iron.

National Enameling & Stamping Co.—This company was organized originally for the manufacture of stamped and japanned goods, but besides turning out these products it owns rolling mills and tin plate plants and turns out open-hearth steel, black plates, tin plate and sheet iron, so that according to the authorities in the iron and steel trade it must be included among the manufacturing iron and steel companies. Its plants are at St. Louis, Milwaukee, Baltimore, New York, Brooklyn, Portland, Conn., Bellaire, Ohio, and Granite City, Ill. The authorized capital stock of the company is \$10,000,000 of 7 per cent. cumulative preferred stock and \$20,000,000 of common stock. Of this amount \$7,658,600 of the preferred stock and \$14,038,100 of the common stock is outstanding. The company has a bonded indebtedness of \$600,000. The company was organized in 1889 and has paid the dividend on the preferred stock regularly. No dividend has been paid on the common stock.

New Haven Iron & Steel Co., which controls the properties and plants formerly owned by the New Haven Rolling Mill Co. of New Haven, Conn. The company manufactures merchant, bar and band iron and steel. The productive capacity of its plants is 20,000 tons a year. The capital stock is \$500,000, all of which is issued and outstanding.

Pennsylvania Steel Co., which has been recently incorporated, controls all the properties of the old Pennsylvania Steel Co. at Steelton, Pa., and at Sparrow's Point, Md. The company makes rails, frogs and switches, billets, slabs, structural steel and bridges at Steelton; and rails, billets and ships at Sparrow's Point. The output of the combined plants is about 438,000 tons a year, while at the ship yard six ships may be built at the same time. Under the new incorporation, the company's capital stock is \$50,000,000, divided equally into common and preferred, the preferred bearing 7 per cent. interest.

Republic Iron and Steel Co., which controls ten iron mines in Michigan, Minnesota and Alabama; coke properties in Pennsylvania and Alabama; coal fields in Illinois, Alabama and Pennsylvania; limestone properties in Pennsylvania, Alabama and Ohio; ten blast furnaces in Alabama, Pennsylvania, Ohio and Minnesota; two lines of railroad, and twenty-eight rolling mills in Indiana, Alabama, Ohio, Pennsylvania, Minnesota, Kentucky and Illinois. This is one of the largest companies in the world outside the United States Steel Corporation. Its products are iron ore, coal, coke, pig iron, bar iron, bar steel, plates, steel rails, sheet steel, nuts and bolts, spikes, cold rolled steel, cut nails, steel fence posts, agricultural steel and steel billets and slabs. The combined annual productive capacity of the company is 1,000,000 tons of bar iron and steel, including sheets, plates, spikes and bolts, 500,000 tons of pig iron and 200,000 tons of steel billets. The product of steel billets will be increased before the year is out to an annual capacity of 400,000 tons. The capital stock of the company is \$55,000,000, divided into \$25,000,000 of 7 per cent. cumulative preferred stock and \$30,000,000 common stock. Of the preferred stock \$20,852,000 has been issued, and of the common \$27,352,000. Of the amount of preferred stock issued, \$545,100 is held in the treasury and \$161,000 of the common. The company has no bonded indebtedness and has met its dividends on the preferred stock regularly.

Sloss-Sheffield Steel & Iron Co., which owns or controls ore lands, blast furnaces, railroads and coke ovens in Alabama. The company's products are coal, iron ore, coke and pig iron. Of pig iron it produces annually 350,000 tons; of coal 5,000 tons a day, and of coke 375,000 tons per annum. The authorized capital stock of the company is \$20,000,000, divided equally into common and preferred stock. Of the preferred \$6,700,000 has been issued, and of the common \$7,500,000. The company has a bonded indebtedness of \$3,835,000. The dividends on the preferred stock have been met.

Susquehanna Iron & Steel Co., which controls rolling mills and blast furnaces in Susquehanna, Columbia, York, Wrightsville and Vesta, Pa., and produces pig iron, merchant bars, plates and skelp. The productive capacity of the plants is 50,000 tons of rolled products a year. The capital stock of the company is \$1,500,000, all in preferred stock. It has no bonded indebtedness, and since its organization in June, 1899, it has paid \$315,000 in dividends.

Tennessee Coal, Iron & Railroad Co.—This company owns 256,781 acres of coal land in Alabama and 46,817 acres in Tennessee. It owns 31,819 acres of ore land in Alabama and 6,576 acres in Tennessee. Of undeveloped mineral lands it owns 58,428 acres in Tennessee. It owns thirty coal mines in Alabama and Tennessee, with a net daily capacity of 19,000 tons. It owns 3,732 coke ovens, with a net daily capacity of 6,000 tons. It owns twenty-nine iron mines with a net daily output of 8,000 tons, and it owns twenty blast furnaces, with a net daily capacity of 3,550 tons. Besides these properties it has steel plants, rolling mills, foundries and machine shops. It produces coal, coke, iron ore, pig iron, foundry, forge and open-hearth steel; steel billets, blooms and slabs, bars and steel castings. The company produced 4,151,496 tons of coal in 1899; 1,182,286 tons of coke; 1,578,442 tons of iron ore; and 651,145 tons of pig iron. The authorized capital stock of the company is \$23,000,000, all issued. It has a bonded indebtedness of \$9,078,419.27.

Thomas Iron Co. of Pennsylvania, which has ten blast furnaces in Pennsylvania, and turns out 250,000 tons a year of foundry, forge, bessemer and open-hearth pig iron. The company has a capital stock of \$2,500,000, all outstanding, and no bonded indebtedness.

Virginia Iron, Coal & Coke Co., which owns or controls thirty-seven plants in Kentucky, Virginia and Tennessee. Of pig iron it produces 500,000 tons annually; of horseshoes, 5,000 tons; of coal, 1,250,000 tons; of coke, 450,000 tons; of steel billets, 100,000 tons; of bar iron, 3,000 tons, and of pipe, 25,000 tons. The capital stock of the company is \$10,000,000, and it has a bonded indebtedness of \$10,000,000. It was organized in January, 1899, and has not as yet declared any dividend.

Warwick Iron & Steel Co., which owns blast furnaces in the vicinity of Pottstown, Pa., with a capacity of 185,000 tons of pig iron per annum. The capital stock of the company is \$1,500,000, of which \$1,413,270 has

been issued. Since the organization of the company in 1899 it has paid a regular dividend of 5 per cent.

Midvale Steel Co. of Philadelphia, whose works at Nicetown, one of the Philadelphia suburbs, are quite extensive. This company, while an important factor in the steel trade, has a peculiar interest from the fact that it has always refused information for publication about its plant or its productive capacity.

Then there is the Lackawanna Steel Co., which will shortly remove its plant from Scranton to Buffalo, and Jones & Laughlins of Pittsburg. The output of the Lackawanna company is something like 365,000 tons a year and that of Jones & Laughlins is only a little less.

These are the chief companies which the United States Steel Corporation does not control. Their total capitalization represents about \$450,000,000, exclusive of bond issues. The capitalization of the United States Steel Corporation is \$1,100,000,000, with a bond issue of \$304,000,000. The total possible annual output of the companies not in the trust and which are mentioned above, is about 10,000,000 tons. The total possible annual output of the United States Steel Corporation has not been reliably estimated, but it is believed to be not less than 15,000,000 tons.

THAT EXPORT TAX ON COAL.

IT HAS STIRRED UP THE ENGLISH SHIP OWNER AS FEW MEASURES HAVE STIRRED HIM IN THE PAST—THE CASE ADMIRABLY SET FORTH IN FAIRPLAY.

The following article from Fairplay, London, shows how the export tax on coal is regarded by those who are identified with the shipping interests in England. It is especially interesting in view of the prospects of foreign markets for American coal:

The budget of Sir Michael Hicks Beach last week came as a bolt out of the blue on the coal trade particularly and on the commercial world generally. A duty on coal had been spoken of by many but expected by few. And the manner in which the proposal has been received shows with how little wisdom business, as well as government, is managed. Some of the arguments or contentions in opposition to the measure are hardly less remarkable, and even absurd, than some of those in favor of it. Let us say at once that we regard the tax as economically wrong, commercially foolish, politically unwise, and financially fatuous. But we do not so regard it for all the reasons advanced by all who have raised their voices in opposition to it. Coal exporters are, of course, mainly concerned with their immediate interests, and their pressing desire is to get out of the present difficulty. Their case is so hard a one that not the most flinty-hearted chancellor of the exchequer can refuse to consider it. Were the government in the direst straits for ways and means it could not in common honesty and common sense call upon a small class of merchants all at once to contribute from a million to a million and a half of money to the exchequer. For that is what it will amount to if the one shilling duty really has to be paid by the exporting merchant on the contracts already entered into—which contracts will amount to probably one-half of our exports for the whole year, which the chancellor of the exchequer expects will yield £2,100,000. The one shilling per duty is from four to six times more than the average profit on export coal contracts, and the exaction of it on the year's contracts would ruin all but the richest of our coal merchants. It is absurd to suppose that the tax can be laid on the shoulders of the foreign buyer by addition to his contract price, and nobody who knows the coal owners will for a moment expect them to assume the burden. But we do not oppose the duty because of its immediate incidence. That can be and doubtless will be adjusted by remission or exemption in the current contracts. Such remission or exemption, however, will materially reduce the revenue from the tax this year, and in the meantime the imposition has caused a vast amount of disturbance, dislocation and friction that cannot but have serious effect on the trade and shipping of this country.

In this disturbance may be seen one of the most obvious objections to the scheme, for it is the essence of good finance to raise money without dislocation of any branch of trade. At the outside Sir Michael Hicks Beach will collect two millions, but in all probability he will not this year collect more than one million from the coal duty and in doing so he will disorganize the business and the relations of coal owners, coal exporters and ship owners. The losses thrown upon these trades will far exceed the amount of the shilling duty, whoever has ultimately to pay that duty. In plain words the money the chancellor will gain by the new impost is not worth all the row it has caused and will cause. The scheme is, therefore, financially fatuous, and that it is politically unwise the government will have abundant opportunities of realizing in the near future when they see their majorities at the polls growing small by degrees and beautifully less. The coal trade is a very big trade and there is an immense electorate connected with it. But more than that—anything that affects coal affects the whole business and social life of the country, and this impost will affect it very injuriously. We have seen it stated somewhere as the opinion of somebody or other in the coal trade, that a shilling duty will have no effect on coal after things settle down. This just shows how people will not look beyond their noses. Coal is our main source of wealth. It constitutes four-fifths of the quantity of our exports. It furnishes outward cargoes, therefore, for four-fifths of the vessels, British and foreign, which come to our ports. It is alike the purveyor and the sustainer of our merchant marine. Fully one-third of the coal we ship to foreign ports is afterwards consumed by our own steamers. If the shilling is put on to the price, British ship owners will have to pay one-third of it. If it is taken off the freights British ship owners will have to pay three-fourths of it. If it is neither put on to the purchaser abroad nor taken off freights, it will, first of all, come off the coal owner when making special prices for export; but he, in turn, will put it on to the home consumer, or on to the colliers, or both. One thing that may be taken as absolutely certain is that the export coal duty will not be accepted by the coal owners as a tax upon them and their "enormous profits." They make no foolish pretence about it, but frankly say that whoever has to ultimately pay the duty it will not be they—and they will take precious good care of that. Therefore, those who hail Sir Michael Hicks Beach's proposal as a just measure of retribution upon the coal

masters are hugging a foolish and dangerous delusion. Can any or all of the indicated consequences follow without serious effect on the coal trade? It is London journalists, mostly, who think no great harm will result, and they as a rule know as much about coal as they do about China.

How little Sir Michael Hicks Beach himself knows about it he showed only too clearly in his budget speech. "If this country by her superior natural advantages could afford to supply coal on such terms as to make it to the advantage of foreign countries to buy, those foreign nations had no right to complain of the duty placed on the exportation of the article." They will not complain—they will simply look about for cheaper coal, either within their own borders or elsewhere. It is all one to them whether British coal is made dear by miners' wages, railway rates, harbor dues, ocean freights or export duties. If it is too dear, laid down at their doors, they will not have it at all. It is a pure delusion that foreign consumers must have British coal whatever it costs. They will pay more for some qualities of British coal than they will for any other coal, because they get value for it, but when the excess price exceeds the comparative value they do without it. Sir Michael Hicks Beach urges that because foreigners did not cease to buy coal from us last year when both prices and freights were several shillings higher than in the previous year, therefore they will not cease to buy it because we put on a shilling by way of duty. But last year prices and freights were rising in all parts of the world, and such was the industrial activity that the demand for coal for the time being exceeded the supply. The reverse is the position now. We are no longer declining orders for coal, but have to go a begging for them—a fact which the chancellor of the exchequer does not seem to be aware of. He concludes that the producers of coal in Europe were unable to "rival" our coal even at the increased prices and freights of last year. They simply could not produce enough for their own home and export trades. All the coal producing countries of Europe are exporters as well as importers of coal, and they all experienced last year a pressure of export demand, just as we did. The cause of this was complex, as has been explained in our columns from time to time, and the fact that foreigners went on buying coal from us last year when the delivered price was continuously going up is no proof that they will always do so. The chancellor's contentions that "the imposition of a shilling duty, which is infinitely less than the fluctuations in the prices over a long series of years during which our exports of coal have increased, would do no real injury at all to our coal trade" is utterly illogical. There is all the difference in the world between a rise under natural economic conditions and a rise created by arbitrary restrictions and fiscal burdens.

It is curious to find the finance minister of a free trade country like this arguing that British coal producers bear the import duties of countries to which coal is exported. It is even more curious to find a man of the chancellor's intelligence expressing the conviction that an export duty on our coal will fall upon the consumer abroad. It is kind of him, no doubt, to express regret that some of the consumers abroad will be British ship owners, and he is sorry he can make no exemption in their favor. But that is of little consequence when they have such a dose of soothing syrup as this: "The additional price which they would have to pay for their coal would be but a small percentage on the cost of that coal at the foreign port at which they would have to buy it, and the burden that it might impose upon the shipping industry would be the merest trifle when compared with the burdens imposed upon that industry by the great increase in the price of coal last year or on some previous occasion." Perhaps if the chancellor saw a foreign bunker bill he would have more respect for "small percentages," but what are we to think of the following? "I must say that having regard to the enormous profits which the shipping industry has been making of late years, having regard to the fact that it of all the industries in this country might fairly be expected to make some contributions—some special contributions—towards the increasing cost of our navy—I do not think I am asking too much of the shipping industry if I ask them to bear this small additional burden, for after all they may relieve themselves of it to a great extent if they choose. If they think they can devote more bunker space to coal and less to cargo, then they will escape the duty altogether."

O, most wise judge! Most just judge! Here is a chancellor of the exchequer who thinks that the shipping industry, which is losing money hand over fist, is still making enormous profits; who thinks that sea commerce is carried on solely for the benefit of the carriers, and not for the owners and consumers of the goods; that the navy is required mainly for the protection of ship owners, and not of the property they convey; that the shipping industry ought to be specially taxed through coal, the duty on which is expressly declared by the chancellor himself to be neither on the producers nor the consumers of this country. And that it will be good business to save a shilling a ton in bunkers by losing several shillings per ton on several hundred tons of cargo space! This impost of a shilling is not a tax upon coal, but upon the trade in coal. Neither the coal owner nor the exporter nor the foreign consumer will pay it. It will come off the price for export and be laid on the cost of production. That is to say it will be divided between the home consumer and the collier. And if it tends to conserve our national coal resources by restricting the exports then it will not produce the revenue for which it has been devised.

The business results of the great Hamburg ocean steamship companies for 1900 have just been compiled, says the Liverpool Journal of Commerce. The six companies referred to show profits of £642,750, against £435,750 in 1899, and the average dividend is 10.47 per cent. upon a combined capital of £6,135,000, against 8.52 per cent. upon £5,112,000. Only one company failed to increase its dividend—the South American, owing to the tariff war, which has been settled. It is stated that the figures here given would have been still more favorable if the companies had not made unusually large write-offs for the year; and these, except in the case of the Hamburg-American line, have not been made public. The Hansa Steamship Co. of Bremen has declared a dividend of 14 per cent., against 7 per cent.

The steamship M. S. Dollar of 4,500 tons dead weight, the contract for which was placed through Mr. Samuel Holmes of 66 Broad street, New York, with the New York Ship Building Co. of Camden, N. J., was successfully launched on Saturday last.

MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

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There is nothing more alluring than the sea; no element of nature which has so many moods and such infinite variety of expression. It has cajoled and beckoned men for ages and those who have gone down to the sea in ships can tell a various story. What realm of literature is there that tells such a strangely worded tale? What other tales are there that so reek with romance? A sea story will always have its multitude of readers who drink it all in mighty draughts though it is teeming with words which they do not understand. Old ocean has been matching her sheer and boundless strength against the ingenuity of man for centuries and the score will never be reckoned till the day of judgment comes and the sea gives up its dead. She has worn the dripping wreath of victory since the days of Noah. Until now. Her master is facing her. The mind of man is triumphing. The modern steamship with the power of 33,000 horses chained in its hold, working in unison and responsive to the slightest touch, is superior to the wild and measureless strength of nature. Storms may check but they cannot stop the steamship. They may batter her bows with countless tons of water; they may tear her fastenings loose, bury her beneath a succession of waves, send every living thing below with hatches battened down, but the steamship will go on. What has done this? The evolution of a century. Man is the most persistent of all creatures. Defeat is but another name for victory since it gives the lesson by which another man profits. It is the story of the clipper ship, the paddle wheel vessel, the iron screw steamer and the twin-screw steel steamship. Don't you want to know all about it? Don't you want to know and to understand this wonderful story of the sea? We promise you it has no counterpart.

The Marine Review has in press a book which tells all about it. It is scheduled to come from the press on Saturday next. The book is known as Patterson's Illustrated Nautical Encyclopedia. It covers thoroughly the sea and its ships. It is brimful of historical information from the time of Noah. In point of fact Noah was the first contributor to this work, for the book contains a very excellent description of the ark. Noah was no small potatoes of a ship builder. He was some pumpkins. The ship which he built was a first rate cargo carrier and others have profited from his design since. The work is painstaking throughout. It has been prepared after years of research. Its definitions are accurate. We have all learned how sailors exclaim "Shiver-my-timbers." We learned that in comic opera. You will be astonished to learn that genuine sailors never say "Shiver-my-timbers," and never have said it. The black-bearded, tawny-faced chap, who rolls down to the foot lights and hitching up his trousers exclaims "Shiver-my-timbers," is a miserable deceiver.

The book deals altogether with five thousand nautical subjects and contains five hundred descriptive engravings. Many of these engravings occupy full pages and are exquisite specimens of the engraver's art. Pictorially the volume is as perfect as it can be, but its great value lies in the information which it contains. It explains to the minutest detail everything about a ship and everything pertaining to navigation, marine engineering and naval architecture. Who ought to be interested in such a work? Broadly, everyone who reads. There is not a term used in the great mass of sea literature which is not explained. Kipling can't spring any of his outlandish phrases upon you to mystify and to awe. With this book at your side you can nail every one of them. It should interest every library in the United States, for there is not such another book on its shelves. It should interest every member of the naval, revenue, coast survey, transport and light-house services, for it is an invaluable reference work for them. It goes thoroughly into every feature of these services. It should interest also members of the merchant marine, yachtsmen, builders of steam and sailing vessels, admiralty lawyers, underwriters, naval cadets and young men on board of state training vessels, for it is crowded with information of value to them.

The book sells for \$3 per copy. Orders may be sent in now and will be filled in rotation. Address all orders to the Marine Review Publishing Co., Cleveland, Ohio.

It is doubtless true that no more purely industrial movement has attracted the attention of the world so completely as the formation of the United States Steel Corporation has attracted it. It remains the one great topic of the times. If anything, interest in the organization is as great abroad as it is at home; in some parts of England it is even greater. Already are to be found those who advocate a reversal of the time-

honored commercial policy of Great Britain to compete with the Steel Corporation. But we fancy it will take far more than a billion dollar corporation to shake the belief of the English in that policy which has made them the biggest buyers in the world in order that they might become the biggest sellers. The situation, however, is not without its attendant danger. Meetings of iron and steel experts are already scheduled to discuss the subject and even Andrew Carnegie has been invited. The canny Scot will doubtless allay British apprehension on the score of American invasion. He is the one man, however, who can point to the remedy, for it lies in the very methods which he himself employed in building up the greatest steel works in the world. The one striking advantage of the United States in the manufacture of iron and steel has been the possession of vast resources of raw material and machinery for its economical handling during every step of its progress from the mine to the finished product. Nature has been generous in her distribution of raw material throughout Great Britain but she has been prodigal in the United States. England, however, has been supremely indifferent to the advances made in labor saving machinery. It has been rather the indifference of one who has been for years the industrial master of the world; of one, who, never having had a rival had begun to dream that a rival could not exist. The awakening has been rude but it has been thorough. It is too much to expect that England will retain the wholly disproportionate share of the world's industrial trade that she has so long enjoyed; but it is idle to deny that she will always have a fair part. Her people are by temperament an industrial race. Her political, economical and commercial systems are fixed and are to be as regularly reckoned with as are the seasons of the year. True her practice of steel making may have to be remodeled to meet the imperative conditions of the time.

The Steel Corporation is not an octopus which has entered the steel trade for the sole purpose of destroying the English market, of gouging the American consumer for the purpose of dumping cheap steel into Europe. It is organized for the purpose of making a profit for itself and not for the purpose of preventing some one else from making a profit.

England has been put to sore straits to raise revenue to support the burden of the South African war. She has placed an import tax on sugar and an export tax on coal. With the first we have nothing to do, but the second offers an interesting avenue of discussion. Does it or does it not afford Americans an opportunity to invade the European market with American coal? We saw the interesting experiment tried last year of shipping coal to Mediterranean ports. It was put down on the docks at a figure which placed it upon an equal basis with English coal. The export tax, which must of course be paid by the consumer, would seem to strengthen the American position. It must be remembered, however, that English coal was selling at abnormally high prices during the past year and is even today about four shillings above normal. English coal at its normal price can stand the export tax and yet undersell the American product. There is a feature of the tax, however, which seems to have been overlooked by the chancellor of the exchequer and which is likely to provoke considerable feeling. That feature is the method whereby coal is handled in a business sense. If it were simply a question to be settled by the colliery owner and the foreign buyer it would be simple enough, but unfortunately it is not. The bulk of coal contracts for steamers' use are made through middlemen. These men contract with the colliery on one hand and with the ship owner on the other. As contracts are made at the end of one year for the ensuing year it can readily be seen that the immediate imposition of the tax means ruin to a large class of business men. For assuredly there is not a shilling's profit to the middleman on a ton of coal; no, indeed, there is nothing like even six-pence. This feature of the tax will have to be amended.

Commercial organizations in leading cities of the country are giving considerable attention to Jules Siegfried, formerly French minister of commerce, and his son Andree, a Paris journalist, who are in America for the purpose of investigating methods of leading industrial organizations. In Cleveland the gentlemen were the guests of the industrial committee of the Cleveland chamber of commerce. They were shown the harbor and visited the works of the Cleveland City Forge & Iron Co., Brown Hoisting Machinery Co., Cleveland Hardware Co., Cleveland Twist Drill Co. and the Sherwin-Williams Co.

A New York dispatch says that the White Star and Cunard lines are to join issues in certain agreements to meet the combination of Atlantic ship interests that is forming under the direction of J. Pierpont Morgan. The Cunard and White Star lines have been running exclusively between New York and Liverpool. It is now said that they will arrange sailings in such a way that there will be alternate departures from New York to Liverpool and English channel ports.

It is understood that as soon as congress assembles in December Senator Frye will introduce a new shipping bill. Senator Hanna in discussing the new measure says: "It will be simpler in form than the one which was before congress during the last session. It will not be as long and will be drawn so that those who could not comprehend the former bill can understand it. The same general principle will be included."

TRAINING THE NAVAL ARCHITECT.

(From the Boston Transcript.)

As an industry of national importance, American ship building has experienced a notable revival within the past few years. With the increased demand for ships came an increased demand for men who could plan and build ships in competition with those of England, which has long led the world in maritime affairs. Something more than Yankee ingenuity was required in the construction of steel commerce carriers and war vessels, and the naval architect with a technical training became a recognized necessity. At present there are two well established schools of naval architecture—that at the Massachusetts Institute of Technology and the one represented by the course at Cornell University. The first technical work was done in Boston about twelve years ago. It was a small beginning, but it resulted in the establishment of a regular course in naval architecture in 1893, and anticipated the revival in shipping and the consequent need of technically trained men. Within a year or two, or since the course has been proved successful, other schools have sprung up, a start being made at the University of Michigan and at Columbia University. Before this instruction was undertaken in Boston the only trained naval architects were foreigners or Americans who had gone abroad for an education.

At Greenwich, England, there is what is known as the Royal Naval College, which is quite different from Annapolis in that men who have received their early training at sea or at other schools go to Greenwich to be educated for all branches of the navy. It is in a sense a mature or post graduate school, with a three years' course in naval construction which is fairly equivalent to the four years' course at the Massachusetts Institute of Technology. It is a very thorough, substantial course, and the school has as high a reputation as any school in the world. At Paris there is the Ecole Polytechnique, which is a government technical school, giving a two years' course in all the fundamentals for scientific technical training. Men are educated there for all branches of the government service; some for roads and bridges, and for the navy and for other departments. A few students from this course are selected for the study of naval architecture, and are given a two years' course, which includes naval engineering. There is also a course in naval architecture at the University of Glasgow, and one has just been established at Charlottenburg in Germany; but as the two better schools—those at Greenwich and Paris—are now closed to all foreign students, American constructors can no longer hope to get an adequate education abroad. It will be seen, therefore, that it was quite time for the establishment of purely American schools, which should take the lead, in a distinctively American way, in the development of our maritime interests, as well as replace the instruction which foreign governments, from their desire to give no further advantages to possible enemies in war, had withdrawn.

The Institute of Technology obtains from its location at the port of Boston certain distinct practical advantages, in addition to those which it may have in theoretical and technical work. The building up of the new navy has had its effect in stimulating ship building, and has compelled the reorganization of the various navy yards, as well as the establishment of great modern ship yards. Boston reaps the benefit of both these movements. The navy yard has been re-equipped on modern lines, and the Fore River Ship & Engine Co., which began with the construction of torpedo boats, has now a great plant, and is building two first-class American battleships. At the navy yard the students of the institute are enabled to study ship and engine construction from a practical standpoint, and to visit ships of all types. For several years, too, the mold loft at the yard has been used by the classes in the course by permission of the navy department.

An illustration of the demonstrations which are made possible by proximity to a first-class port is the progressive speed trial which is necessary in determining definitely the amount of power required to drive a ship of a certain size at a certain rate of speed. The work requires the services of six men and several hours of continual experimentation, and is of advantage in commercial as well as in naval ship building. Several ships have been turned over to Prof. Cecil H. Peabody, who has charge of the institute department, for this purpose, including the new revenue cutter Manning, to which a trial was given on the measured mile maintained by the Bath Iron Works. In this instance an entire day was spent in experimenting at speeds from six knots to sixteen. The result shows that for the maximum speed which was obtained by natural draft, 2,200 H.P. was required. The experiments brought out, among other interesting points, the horse-power in relation to the initial friction, the load friction, the friction and resistance of the propeller, wake gain and thrust deduction, skin resistance and wave-making resistance. The calculation of all these points in the power of a ship is a troublesome but a most necessary problem. If a builder expects a ship to make 15 knots, and she makes 16 knots, there is no advantage, as might be generally supposed, but rather a loss, because it means a direct waste in the power of the engines. When ships are designed to make a moderate speed, their engines should be accurately proportioned to this speed, and progressive speed tests are thus among the most valuable to students of naval architecture. The students of the institute have also taken part in tests in the towing of ships and barges. Here, by means of a device which may be roughly compared to an exaggerated spring scale, they are able to measure accurately the strain of the hawser under varying conditions. Another problem has been to incline ships to find their center of gravity, or, in other words, to establish their stability.

Prof. Peabody says the purpose of the course at the institute is a broad and thorough scientific foundation with a knowledge of the practical application of that training. This is best done by laboratory work and drawing, and it is attempted to make students understand how to use the tools so that they can attack any problem and get direct results at once. That this has been successfully accomplished is shown by the fact that men from the institute are in various positions all over the country. They find responsible employment as government draughtsmen in charge of work, as hull draughtsmen in charge of work, as engine draughtsmen, as ship builders, and as inspectors in naval architecture, marine engineering and construction. Only two are recorded as being in business, the others being in big ship yards from New York to San Francisco. One man went to Newport News to do responsible work, and immediately began to gather Technology men around him. He knew what their professional equipment would be, and consequently was able to make an

economical use of his services. At other ship yards the graduates who have secured places of authority have done the same, until these groups are now exerting a considerable influence on American ship building.

The department of naval architecture is closely related to all the general courses at the institute. For example, instruction in marine engineering offers a natural connection and instruction in the strength of materials in the department of physics is quite essential. A feature of the department is the large, well-lighted drawing room where students are employed on plans of all sorts, from the design of a yacht to the detail calculations of a great "ocean greyhound." The room contains a variety of models, as, for instance, Gen. Charles J. Paine's three cup defenders, which may be contrasted with a square-rigged ship of the old style. In an adjoining room are cabinets filled with the working plans of ships which have been actually built. In the case of a warship, hundreds of detail drawings are necessary both for the construction of the hull and of the machinery, and these are all worked out so that they may be used as a direct means of instruction.

The department also owns a good library and provides students with complete mimeograph notes of all the regular lectures of the course. The mechanical demonstration is given in the various engineering laboratories, and tests are made for the solution of a great variety of mechanical problems. It is only necessary to name a few of these tests to show the exhaustiveness of the work. For instance, there are tests of the tensile strength of bolted joints, of different kinds and sizes of ropes, and of different knots used in fastening ropes, of the performance of a surface condenser, of the flow of steam, of a centrifugal pump, and a great variety of engine tests. In the thesis work experiments are made on the stability of a battleship under damaged conditions, on the action of wind pressure on sails, on the vibrations of steamships, and on a great many other similar matters. It is considered that applied mechanics is as much a part of the course of naval architecture as of engineering. The courses at the Institute of Technology are all branches of the same organization, and the student in naval architecture has a sound all-round engineering training with a leaning toward mechanical engineering.

AROUND THE GREAT LAKES.

Capt. Denis Sullivan has been appointed agent of the Steel Corporation fleet at Chicago.

Will R. Huntington has sold his 41-ft. naphtha launch *Dearest* to Carl Neilsen of Sandusky. He is now on his way east to bring his 72-ft. twin screw naphtha launch from the coast to the lakes.

At all Lake Erie ports all the harbor tugs this season will be controlled by the Great Lakes Towing Co. Arrangements have just been made with Capt. J. P. Nagle of Toledo for his three tugs, and as many more as will be necessary for first-class service. Capt. Nagle will represent the Great Lakes Towing Co.

Fred Rogers, who has been for some years chief engineer of the Lehigh Valley Transportation Co., has been appointed chief engineer of the consolidated Lehigh and Union steamboat lines, and William Daniels, for a long time in the employ of the latter company, has been made purchasing agent of the combined lines.

Mr. J. C. Gilchrist of Cleveland now has fifty vessels on the lakes—forty-four steamers and six consorts. His latest purchases are the steamers *Marquette*, *Colonial* and *Siberia* from the estate of John W. Moore. Cash was paid for these three vessels. John J. Boland and others of Buffalo have purchased the schooner *Saveland* from A. A. Parker of Detroit.

Pittsburg Steamship Co. does not seem like a very broad name for an organization so large as that controlling the 112 steel vessels of the United States Steel Corporation. That is the name under which the Steel Corporation ships will be operated. The title is taken from the organization that controlled the Carnegie fleet. The charter of the old Carnegie vessel organization will be retained.

Mr. W. F. Herman, general passenger agent of the Cleveland & Buffalo Transit Co., has issued a very attractive card announcing the resumption of service between Cleveland and Buffalo. Daily trips including Sundays are now in order, and during July and August double daily service will be maintained. The card is illustrated with a picture of a very attractive young woman just stepping out of a gripsack and holding in her hand a miniature of the City of Erie, the crack vessel of the fleet.

The steamer *Easton*, lately engaged on Chesapeake bay, but which is to be brought up from the coast by the H. H. Williams Transportation Co. for service on Lake Michigan, was purchased through Samuel Holmes of 66-68 Broad street, New York, who acts as agent for the sale or construction of vessels of all kinds. Mr. Holmes also chartered for the Northern Steamship Co. the passenger steamer *Miami*, which is to come from the coast shortly and run between Mackinaw and Duluth, connecting at Mackinaw with the large express steamers of the Northern line.

The new steel passenger and freight steamer *Argo*, just completed at the Craig Ship Building Co.'s works, Toledo, made her initial trip during the present week, going to Sandusky for a cargo of cement. She was built for A. Booth & Co. and is to be used in passenger and freight service from Duluth to Port Arthur. The vessel is 185 ft. over all, 31 ft. beam, and 12½ ft. depth of hold. Her gross tonnage is 1,089 and net tonnage 740. The engine is a triple expansion, having cylinders of 15, 25 and 42 in. diameter with a stroke of 24 in. Steam is supplied by two Roberts water tube boilers. Mr. C. W. Turner, superintendent of the Booth company, is highly pleased with the vessel.

Mr. C. B. Calder of the Detroit Ship Building Co. delivered the steamer *Roumania* in Cleveland a few days ago after alterations and repairs that make her one of the best wooden vessels on the lakes. Capt. W. C. Richardson, who put the *Roumania* in Mr. Calder's hands for the application of Howden draft appliances and a general overhauling, is highly pleased with the work. She has two new Scotch boilers of 11 by 11½ ft., allowed 160 lbs. steam pressure, and on the trip across Lake Erie made 14 miles an hour. The *Roumania* takes the barge *Barlum* to the Sault. The latter will be turned over to F. H. Clergue, her new owner, and then the *Roumania* will run without a consort, probably for the whole season. The schooner *Barr*, also sold to the Clergue organization, will be taken to the Sault by the steamer *Outhwaite*.

TEN YEARS' NAVAL CONSTRUCTION.

PROF. J. H. BILES REVIEWS THE PROGRESS OF THE NAVY IN THE UNITED STATES—A COMPARISON OF TYPES—A MOST INSTRUCTIVE AND EXHAUSTIVE ADDRESS.

Prof. J. H. Biles read at a recent meeting of the Institution of Naval Architects in London a paper on the subject "Ten Years' Naval Construction in the United States," a note of which was made in the Review. The paper is interesting as a review of the new navy since its inception. The major part of the paper, stripped of tables and much technical verbiage, is given below. Prof. Biles said:

In 1891 I had the honor to present to this institution a paper entitled "Some Recent Warship Designs for the American Navy." This paper gave in outline a description of the modern ships existing in the navy, the first one having been made in 1883. It also gave in outline a comparison of some of these ships with ships which were then building, or had been recently completed, for other navies. The paper was, however, chiefly devoted to a description of the ships that were projected in the end of 1889, and that were then all in their initial stages of construction. I ventured to say that the American ship designers and builders have been very capable in producing vessels quite equal to their promises, though there were at that time people who thought that, in some respects, the Americans were rather sanguine in their anticipations. I have thought it may interest the members of this institution to bring together the facts, as far as I have been able to obtain them, to show to what extent the promises made when my former paper was read have been realized, and in addition to give as much information as I can of the intentions in designing of the American naval constructors. If it can be shown that their promises have been fulfilled, it is a fair assumption that what they now propose will be fully realized. Most of the information which is given in this paper has been obtained from official documents published by the navy department of the United States, which corresponds to our admiralty. All interested in warships and their construction owe a debt of gratitude to the generous manner in which this department of the government gives information to the people. In this country our professional newspapers to some extent do the work that is done by the navy department of the United States. Probably some information which is contained in this paper today has been already published in our professional papers, but it may not be out of place to bring some of this information together in this institution, to afford an opportunity of discussing some of the interesting points in the American naval constructors' designs, as well as to give the information to many who have not the time or opportunity of following connectedly and closely these developments of naval construction in the United States.

In order to understand why so much information is made public by the United States authorities it is desirable to remember that no ship of war is built in the United States without a special act of congress being passed authorizing its construction. This act may or may not, but generally does, contain specific details as to the kind of ship and its leading characteristics. Frequently its cost, displacement, speed, armor, armament and coal carrying are defined in the act, and are arrived at after full discussion both in the committee and in the house. In this way all who are interested have an opportunity of hearing what is said, and, if they wish, doing what they can to influence the formation of the act which fixes the design of the vessel. After the act is passed the navy department prepares the designs for the ship in conformity with the act, and the various details are fully discussed between the different bureaus. Plans are then issued to builders to tender upon, and alternative designs are invited from the builders. If, in submitting their tenders, the builders submit alternative designs, they are considered in relation to the act of congress and to the designs prepared in the department; and, inasmuch as the builder has to be responsible for the speed and draught of the vessel, there is no insurmountable difficulty in his getting his own alternative design adopted, if it is as good as that of the department. It is evident that this process will produce a design upon which the greatest possible amount of discussion has been expended; and whether the method of design by discussion is a successful one may be judged to some extent by the productions of the United States navy department.

SHIPS PROJECTED IN 1891.

Prof. Biles said that before describing the new ships he found it desirable to refer to those which were projected at the date of his last paper, 1891. At that time there was one type of battleship, having three examples; five types of cruisers, varying from 8,000 to 2,000 tons displacement, and a harbor defense ram. The total tonnage projected or built in 1891 was 165,646 tons, costing \$46,588,000, while the total tonnage projected today or built is 353,400 tons, costing \$96,613,000. These figures are very impressive and interesting. There has been no attempt in the United States to develop more than one class of battleship, though naturally with the lapse of time and the evolution of ideas the type changes somewhat; but it is evident that the American naval constructors have never contemplated building two classes of battleships at the same time. They always have intended to build battleships superior to those already built and never have made any provision for another type of battleship that could in any sense, from their point of view, be called a second-class battleship. This may be seen from the following list of displacements and types of battleships built since 1889:

Name.	Displacement.	Date of authorization.
Indiana	10,200	1890
Iowa	11,340	1892
Kentucky	11,540	1895
Alabama	11,565	1896
Maine (new)	12,400	1898
Georgia (sheathed)	15,320	1899
Virginia (unsheathed)	14,950	1900

THE QUESTION OF ARMOR AND ARMAMENT.

The last two ships, Prof. Biles explains, are of practically the same design, but the 1899 ships were sheathed, thus making their displacement slightly greater than the 1900 ships. The same may be said with reference to speed, but in no case has a later ship been designed to have a

less speed than an earlier one, the intended speed of the latest ship being 19 knots, as against 15 knots in 1899. With reference to armament the same intention to have more powerful guns, and more of them, than in other battleships exists in the minds and in the designs of the American naval constructors. It is true that, comparing the Indiana, the 1891 class, with the Virginia and New Jersey classes, the 1899, there is a reduction in the size of the big guns from 13 in. to 12 in.; but the guns of all sizes are more powerful, and, naturally, are much improved, as have been those of all other nations during the same period; but the number of 6-in. guns has increased from four to fourteen.

With reference to protection, improvements in the character of armor have enabled the United States naval constructors, like all others, to reduce thicknesses, but they have not made (until the last designs) the decided change in the arrangement of protection which has been adopted in our navy. We have adopted much thinner side armor, and have associated with it the dome shape form of protective deck which used to be peculiar to cruisers. But they still adhere to the dispositions, which existed ten years ago, of having the thickest armor at the water line, in a belt extending from 5 ft. below to about 3 ft. above load water line, but with a much thinner belt between this point and the main deck. This arrangement has been, however, somewhat modified in the relative thicknesses, as, in the case of the Indiana, the armor was 18 in. at the water line and 5 in. above; but in the later vessels of this type—the Maine class—there is 12 in. at the water line and 6 in. above. In the latest, the Virginia class, the armor at the water line is 11 in. and 6 in. above; but there is a dome-shaped protective deck 3 in. on the slope and 1½ in. on the flat.

With reference to disposition of armor for gun protection there have been considerable changes. In the 1891 ships—the Indiana class—the 13-in. guns were protected with turrets having sloping sides of armor 17 in. thick, the barbette, or base of the turret, being protected also by 17-in. armor, while the 8-in. guns (of which there were eight in number, in four pairs) were in turrets having 8-in. armor on the front and 6-in. on the rear, with their bases protected by 10-in. armor part of the way down, and by much thinner armor in way of their ammunition tubes. The four 6-in. guns were in casemates on the main deck, having 5-in. armored fronts and 2-in. rears. In the next type of ship, the Iowa, practically the same arrangement of guns and armor is carried out, except that the forward 12-in. guns are much higher, but the turret and barbette armor was reduced to 15 in. In the Kentucky and Kearsarge, the next type, we see the abandonment of four of the 8-in. guns and the substitution of the four 5-in. guns by fourteen 5-in. guns. The 13-in. guns had turrets the same as the Iowa, with 17-in. front plates and 15-in. at the rear, barbettes being 15 in. thick at the front and 12 in. at the rear. But the remarkable feature of these designs was the novel arrangement of the double turrets, in which the 8-in. guns were superposed upon the turrets of the 13-in. guns, the whole being rotated by the same mechanism. This startling innovation has caused a great deal of discussion in the United States, and has been generally approved of by the ordnance officers, but has been strongly opposed by the naval constructors.

The fourteen 5-in. guns were mounted on the broadside on the main deck within an armored superstructure, or box battery. This also is an unusual arrangement of guns, though it is only a reversion to the ordinary arrangement of the earlier ironclads. It is heavier than the arrangement of casemate adopted in our navy, probably to the extent of 200 tons on a battleship of this kind; and, even with this extra weight, it reduces the arc of training of the guns. This arrangement has the advantage of bringing the guns' crews more under the control of the gunnery officers of the ship, and thus increases the tactical advantage of the battery. But against this must be set the advantage in the casemates of isolation of the guns' crews, which is, no doubt, great in case of the disablement of any one gun's crew. It is to be remarked that, while the protection or freedom from penetration is much better in the box battery than in the casemate arrangement, as the guns are protected in rear as well as in front, the damage is much greater, in the event of penetration of the side by shell, in the former than in the latter case, as probably in the former the whole of the battery's crew would be placed hors de combat.

In the next type of ship which was built, the Alabama class, the 8-in. guns were completely done away with, and the fourteen 5-in. guns were replaced by fourteen 6-in. guns, otherwise the arrangement was practically the same. This battery is of the same power as in our ships, but the 6-in. guns on the main deck are all in a box battery, similar to the Kentucky. Four are in an open battery on the upper deck, where they have protection only on their fronts, and not in the rear; and two others are forward on the main deck, which also have front protection only. The normal coal supply of the Alabama is 800 tons, as against 400 tons in the Kentucky. This change, together with the changing of the 5-in. guns to 6-in., has necessitated the doing away with the four 8-in. guns, so that the armament of the Alabama seems to represent a stage, in the opinion of the naval authorities, at which they had practically agreed with the British naval authorities in their ideas as to the best arrangement of armament, except in that part in which they prefer to adhere to the box battery rather than to have casemates.

In the next type of ship—the Maine, Missouri, Ohio—we have almost a repetition of the Alabama in the battery arrangement. The important change in these two ships, however, is the amount of speed and coal supply, the former being increased from 16 knots to 18 knots, while the latter is increased from 800 tons to 1,000 tons, the normal displacements being increased from 11,500 tons to 12,500 tons, in order to obtain these results. It is to be noted, however, that practically all the earlier battleships attained 17 knots on trial, and that it is probable that the Maine class will not be 2 knots in excess of the earlier classes. The last two classes, the Georgia and Virginia, have their largest guns reduced to 12-in., but their armament is very much strengthened by a battery of 8-in. guns, eight in number.

SHIPS OF ENORMOUS BATTERY.

The latest information on this subject seems to be that all the ships of both these classes are to be fitted with the 8-in. superposed on the 12-in., and also a pair of turrets, one on each broadside, each having two 8-in. guns. There seems to have been a great conflict of opinion as to whether the arrangement of the Indiana or the arrangement of the superposed turrets should be adopted, but the latter arrangement seems at present to

be most favored. The thickness of armor on the turret in this latter class is reduced to 12 in. on the front, and 11 in. to 9 in. on the rear in the turret for the 12-in. gun, while the barbette has 10 in. to 6 in. On the 8-in. turret the thickness is 8 in. to 6½ in. forward and 6½ in. to 6 in. aft. The 6-in. guns are twelve in number and are arranged in a box battery on the main deck. These vessels are to have a displacement of 14,900 tons, or 15,300 tons if sheathed, and are to have a speed of 19 knots. They have a coal supply of 900 tons and a bunker capacity of 1,900 tons. One cannot fail to be struck with the enormous battery of these ships, and with the great protection which it has. It may also be noted that their draught is comparatively small, being only 24 ft. They are to have Babcock & Wilcox water tube boilers. It is true, therefore, that the tendency has been to increase the size of battleships, and to have no second-class battleships, but rather to allow the older first-class to become, by the lapse of time, in some sense second-class. There have, however, been created for harbor defence purposes four 3,000-ton monitors.

These vessels—the monitors—are actually being built somewhat larger than they were originally designed. They have two 12-in. guns in one turret and four 4-in. guns on a superstructure. The side armor is 11 in. at the top, tapering to 5 in. at the lower edge, which is 5 ft. below the water. The upper edge is 3 ft. above the water. The armor of the turrets is 10 in. thick, and, unlike the earlier monitors, it has a barbette, raising the turret on the upper deck of the ship. This raises the center of the 12-in. gun, so that it is 10 ft. above the water line and 7 ft. above the deck. The openings round the funnels and ventilators are armored with 6-in. armor. There is a superstructure, built up amidships, extending to within 8 ft. of the side of the ship, extending over two decks in height, the lower of which carries the 4-in. guns, and the upper some smaller guns, and also affording additional accommodation, for the people who live on board, of a very much better character than is usually the case in monitors. These vessels are only intended to steam about 12 knots, and have a small coal supply of 200 tons, the mean draught being only about 12 ft. 6 in. They have the defect common to all monitors—that the opening of almost any one compartment to the sea would, in all probability, cause them to sink. It seems to be quite unnecessary, in this class of ship, to put in anything like the elaborate subdivision that exists in them.

Up to the time of the Maine class, 1898, there was no attempt made to adopt water tube boilers in the battleship, but in the Maine twenty-four Niclausse boilers are to be fitted, and in the Missouri and Ohio there are twelve Thornycroft boilers in each. The Georgia class and the Virginia class are to have water tube boilers. The engines are to attain 19,000 I.H.P. They have a 48-in. stroke, running at about 110 to 120 revolutions, but in the Maine class the stroke has been reduced to 42 in. In the four monitors there are water tube boilers, each ship having a different type—Thornycroft, Niclausse, Mosher and Babcock & Wilcox. The results of these four vessels will be watched with a great deal of interest.

A GENERAL VIEW OF THE CRUISERS.

Turning to the cruisers, the Brooklyn was built in 1892, practically a sister ship to the New York. Nothing more was done in large cruisers until 1899, when nine were projected, and in 1900 a further six. Dealing with them in the order of their displacement, the California class, three of which were ordered in 1899, are vessels very similar in dimensions to our Drake class, being about 500 ft. by 70 ft., with a draught of 24 ft. They are intended to steam 22 knots, and are to have 23,000 H.P. These vessels are armed with four 8-in. and fourteen 6-in. guns. They have a complete belt about 7½ ft. wide, 6 in. thick on top and 5 in. at the bottom amidships, tapering to 3½ in. at the ends. Above the belt, for the length of the battery, they have 5-in. armor. Their guns are worked in pairs in turrets having 6½-in. armor, with 6-in. barbette. The California, Nebraska and West Virginia of this class, are sheathed; the Maryland, Colorado and South Dakota are unsheathed. The unsheathed vessels are about 700 tons less displacement than the Drake class (which are also unsheathed), and they have a knot less speed and 300 tons less coal, but 1 ft. 6 in. less draught. The Drake class has two 9.2-in. guns, against four 8-in. guns, and a casemated battery against a box battery. It is very difficult to compare ships of different classes with each other, and even ships of the same class in different navies. For instance, the Maryland is an unsheathed cruiser, but closely approximates to the new United States battleship in the character of the arrangement of armor and armament, but in the power of these qualities she is necessarily inferior. Their relative speeds on trial are 22 and 19 knots, and, probably, in ordinary working condition for long periods would be 19½ and 17½ knots. The gun power of the battleship is overwhelmingly greater than the cruiser, and she has only her 2 knots sea speed or 3 knots trial speed to compensate. The cost of the cruiser is 10 per cent. more than the battleship. She has a crew of 18 per cent. larger, probably in consequence of her higher speed. It is difficult to estimate the value of two to three extra knots speed, but it may be seen from this direct comparison what it costs in the form of armor, armament, first cost and upkeep expenses.

If we attempt to compare the Drake and Maryland, we have again to value a difference in speed of 1 knot and 25 per cent. more coal against the difference between two 9.2-in. guns and four 8-in. guns. Here, again, the Americans seem to prefer a dominating armament to other qualities. It is, at any rate, a quality which is more likely to have a real existence in a ship in time of battle, as speed is dependent upon the state of the bottom and the efficiency of the machinery, and is very apt to be less than it is expected to be.

The St. Louis class is of 9,700 tons displacement and 22 knots speed, with a normal supply of 650 tons coal. Each ship has a partial belt amidships, 200 ft. long, 7½ ft. wide and 4 in. thick, surmounted by a partial belt 133 ft. long and 4 in. thick, extending to the upper deck. The protective deck behind the armor is 3 in. on the slope and 2 in. on the flat. The principal armament consists of fourteen 6-in. guns, eight in a box battery and four mounted on the upper deck immediately over the corner guns in the battery below, and protected in front by 4-in. armor, and two mounted in the open at the middle line fore and aft on the upper deck.

These vessels, the St. Louis class, are very similar to our County class, but they are a knot less speed. Our guns are the same in number and caliber, ten of them being in casemates, six on the main and four on the upper deck, where the remainder are mounted in two pairs in turrets 5 in. thick at the middle line forward and aft. The normal coal supply

of our ships is 150 tons more than the United States ships. Our ships seem to be at least equal to the United States ships of this class; but it should be noted that the superiority in speed of 1 knot is expected to be obtained with practically the same horse power. The relative value in speed cannot, therefore, be properly judged until the vessels are tried, as the United States' builders will probably provide for a greater margin of speed than we may expect in our ships, as they guarantee the speed, and not the power, as our builders do.

The Denver class are 3,200 tons displacement, 16½ knots, 470 tons coal. They have no side armor, but have protective deck 2 in. on the slope, ½ in. on the flat. Their principal armament is ten 5-in. guns on the upper deck. They are sheathed. These vessels are like our small second-class cruisers, but they are nominally 3 knots slower on trial, and do not seem to be any improvement upon our vessels. There are no vessels in the United States navy of a class similar to our third-class cruisers, but they have built since 1891 nine gunboats of 1,000 to 1,300 tons, and of 13 to 15 knots speed. They have no protection, their principal armament being six 4-in. guns. They have a very limited amount of subdivision, and can hardly be looked upon as war vessels of much power, but they act as good training ships.

TORPEDO BOAT AND DESTROYER CLASSES.

In the torpedo boat and destroyer classes the types are varied. The United States naval constructors began by making vessels similar to the European types; but they have departed from these, and developed vessels of a slower but more powerful type. Up to 1894 three small torpedo boats were all that the United States navy possessed, but in that year three torpedo boats of 144 tons and 24½ knots speed were ordered. In 1895 three more of 165 tons, and one of 180 tons were ordered. The former obtained 28½ knots, the latter 27 knots speed. In 1896 ten boats were ordered. They were: First, a destroyer, the Farragut, of 240 tons and 30 knots speed; two others, the Dahlgren and Craven, of 144 tons and 30 knots speed; two 110-ton boats of 22½ knots; one of 98 tons and of 22½ knots; two of 65 tons and 20 knots; and two of 45 tons and 20 knots. The Farragut was of the Desperate type, and the Dahlgren and Craven were similar to the Cyclone, built by Normand for the French government. In 1897 three destroyers were ordered. They were all 30 knots speed, one of 340 tons, one of 248 tons and one of 235 tons. In 1898 twelve torpedo boats of about 165 tons and 26 knots were ordered, but in three of them the builders guaranteed 28 knots. There were also sixteen destroyers of 400 tons to 420 tons ordered. There were two of 28 knots, nine of 29 knots and five of 30 knots.

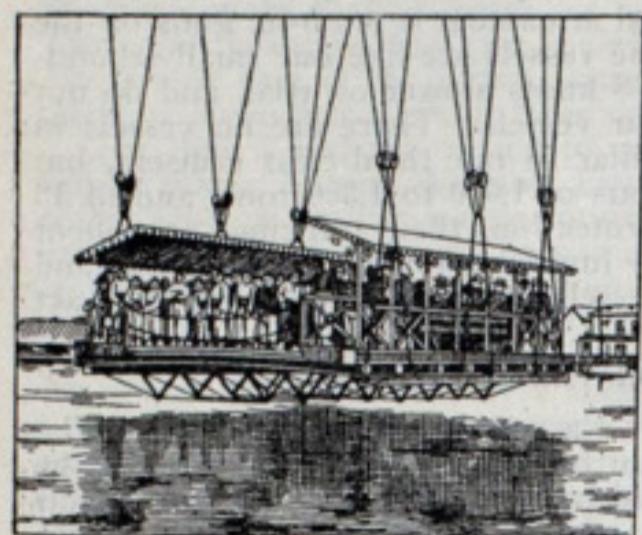
GENERAL SUMMARY AND COMPARISONS.

Commenting on the ships Prof. Biles says: "From the foregoing particulars it may be seen that the United States naval constructors have produced ships which should give them satisfaction in their results. Their cruisers generally call for little comment. Ours are not very dissimilar and will, it is hoped, when finished give satisfaction to their designer. The most striking difference is in their battleships. Their differences are of two kinds. First, the protection of the 6-in. battery, which is armored all round. Second, the addition of eight 8-in. protected guns to the principal armament. The system of carrying four of these guns in turrets superposed upon the turrets of the 12-in. guns, have been advocated by the ordnance bureau and opposed by the construction bureau. Comparing the arrangement of the Virginia with the Georgia, as first proposed, it may be remarked that the arrangement in the Indiana, which is very similar to the Georgia, has not given complete satisfaction on account of the interference of the 8-in. and the 12-in. guns. It is almost impossible, when firing ahead with the forward 8-in. guns, to work in the forward 12-in. turrets. This is avoided by the superposed turrets, which for two guns has as much power of broadside fire in one broadside as the four 8-in. It would seem from this that the fitting of the two independent 8-in. turrets in the Virginia, in addition to the superposed 8-in. turrets, is repeating the difficulty (at any rate for one end of the ship), which has been experienced in the Indiana class, and, in consequence, a logical conclusion would be to do away with these independent turrets and use the weight in another way. Whichever arrangement is adopted the fact remains that these ships will have eight 8-in. guns or its equivalent weight of armament of 400 tons more than our battleships. Their armor protection is thicker and more extended, as they have a complete belt, against a belt about five-sixths the length of our battleships. They are to have one knot more speed. Some rather important details, which are common to the larger class of American ships, are worth noticing. Cofferdams filled with obturating material, which is expected to expand when in contact with water, are fitted very generally at the sides of the ship. This material is the pith of the corn stalk, and has been experimented upon very fully by the navy department, with the result that they prepare their designs with the intention of adopting it generally. It is evident that if the corn stalk material swells when in contact with water sufficiently to fill up holes made by shot, it will have an important effect upon the margin of stability, and probably of buoyancy of a ship in action. The water tight doors throughout the ship can be closed from a central station under the control of one officer. This has often been advocated, but has not been adopted as a general system in any navy until quite recently. It is the general practice in the United States battleships to adopt what they call docking bilge keels. These side keels act as bilge keels, and also act as side keels for docking, distributing the pressure over a large area of the bottom of the dock and reducing the stress upon the structures of the ship. It may be noticed that the complements of the United States navy are generally less than those of our ships. It is undoubtedly that in the battleships the 8-in. guns would be able to penetrate the 6-in. protection of our casemates, and as with the Virginia arrangement they can fire six on each broadside there can be little doubt of the great value of these additional guns. If it is decided to retain the 8-in. guns in the independent positions, it would make in some respects a better arrangement if they were in echelon, as then they would all fire on each broadside, and could be as well as at present in right-ahead or right-astern positions."

The Standard Oil Co. has ordered of British builders five steel sailing vessels of about 5,000 tons dead weight capacity each, which will be employed in the transport of petroleum from the Atlantic coast of the United States to Eastern Asia. The Standard company has hitherto used chartered vessels for this service.

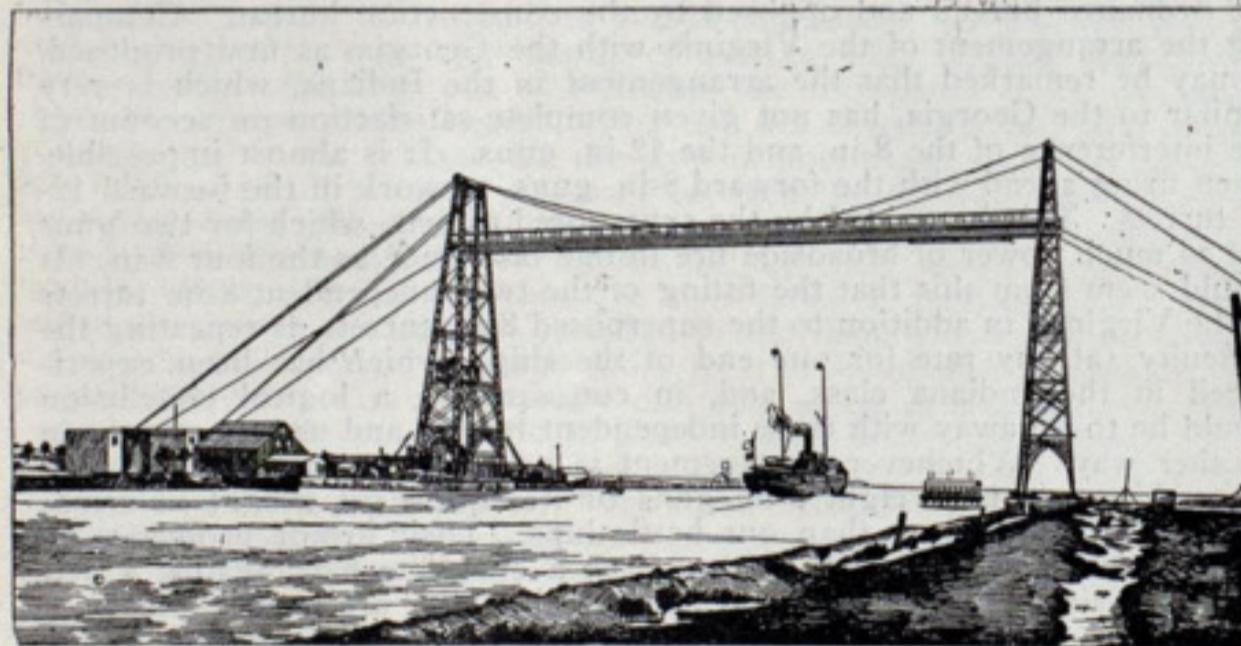
A BRIDGE FERRY.

In a recent issue the Review called attention to a system of bridge ferry designed by two Frenchmen—F. Arnodin and De Palacio—which, during the past two years has been increasing in favor in the eyes of engineers. The Review is now permitted to illustrate the design of the bridge ferry. The advantage of the system lies in the fact that it leaves the channel entirely clear at all hours, requires no long and steep approaches, and transports persons and goods without change of level. The



Arnodin-Palacio ferry consists primarily of a straight, horizontal railway crossing the channel at a sufficient height to permit tall-masted vessels to pass at high tide. Evidently the type of structure most suitable for this railway is the suspension bridge, because it is strong enough to sustain the load to be transported, because intermediate supports are unnecessary, and because but little resisting surface is offered to the wind. Messrs. Arnodin and Palacio therefore employ only stiffened suspension bridges of a special type with removable parts, supported on skeleton or built tower and designed to take up the strains produced by the bridge on the towers. The platform of the bridge carries two lines of rails, on which a carrier travels by means of wheels, varying in number with the weight to be carried. From the carrier a platform or car is suspended by means of wire stirrups, at the level of the quays on each side of the channel. The carrier comprises a frame suspended below the level of the rails, and moves from one end to the other of the bridge. The car or ferry platform is decked, the suspending wires being arranged in triangles, so as to secure the necessary stiffness and to prevent oscillation. The carrier is driven by motive power of any kind. The carrier wheels are arranged in pairs working on parallel rails placed closely together, forming each track, by which arrangement the carrier cannot leave the track. The ferry platform or car can be designed to meet the most varied conditions of traffic. The bridge itself, constructed so as to comprise only those parts indispensable to strength, is provided with a framework of latticed girders well braced together. On each side of the platform thus formed are light foot bridges for repairing and lubricating the moving parts.

The most recent application of the Arnodin-Palacio ferry bridge system is to be found at Bizerta. The deep-water canal which connects the magnificent lake of Bizerta with the Mediterranean sea cuts through the road which leads from Bizerta to Tunis. In order that traffic might not suffer from this destruction of the road it was necessary to provide some means for bridging the canal. At first it was decided to employ row boats, but the traffic was so great that a steam ferry boat was constructed in 1892. Although the Mediterranean has no appreciable tides, there are,



nevertheless, ebb and flood currents, which vary with the condition of the sea. Against these currents the steam ferry proved ineffective when they were reinforced by the wind; for which reason the ferry boat was guided to the slip on either shore by a heavy steel cable. This arrangement would no doubt have proved satisfactory enough under ordinary circumstances, but there was constant danger of the cable's blocking the passage of a ship. It was therefore decided to build a ferry bridge after the system of Arnodin and Palacio.

The rails, in the Bizerta structure, are supported by the girders of a metallic platform. The cables whereby the platform is suspended are eight in number, anchored to the top of the towers. The strain on the towers is taken up by eight additional cables (four on each side of the channel), securely anchored in masonry on shore. Forty smaller cables extend from the towers and assist the main cables in supporting the rail platform. The distance between the towers is exactly equal to the width of the canal, namely, 109 metres (357.5 ft.). The platform is supported at a height of 45 metres (147.6 ft.) above the quays. The car is 10 metres (32.8 ft.) long, and 7.5 metres (24.6 ft.) wide. This car, together with the cables and carrier by which it is supported, weighs (unloaded) 24 tons, and has a carrying capacity of over 56 tons. Sufficient room is to be found in the car for two large and four small carriages, together with 90 foot passengers, or for 270 passengers without any vehicles. The carrier is propelled by a steam engine placed above the great arch in the tower on the left bank. The steam engine drives a drum, about which a steel cable is wound, passing over pulleys at each end of the railway, and secured to the carrier. Although the engine is nominally of 15 H.P. a boiler of only 10 H.P. is used, since the ferry is operated only intermittently. The car crosses the canal in about 45 seconds.

The ferry bridge was begun in January, 1897, and opened for traffic on June 12, 1898. The total cost was 560,000 francs (\$112,000).

POSSIBILITIES OF THE SUBMARINE.

John P. Holland, the inventor of the submarine torpedo boat Holland, in a lecture in New York on Tuesday evening of this week declared that in the course of a few years submarine vessels would supplant surface craft for short journeys by water. He also said that the submarine torpedo boat would be so formidable an instrument of war that the only solution of the problem of avoiding its destructive effects would be for nations with seaports never to go to war at all.

"As soon as men overcome their fears and learn to go down beneath the water as they now skim its surface the progress of the submarine boat in commerce will be rapid," said Mr. Holland. "Within the next ten years we shall have made more progress in submerged navigation than has been made in the 300 years that have just passed. Within that period I expect to see submarine boats engaged in regular passenger traffic. For transatlantic travel submarine boats will never be possible commercially. For short trips the submarine offers commercial advantages that will render it a dangerous rival of the surface sailing vessels, if, indeed, it does not drive the latter entirely out of competition in certain waters."

"Take, for example, the trip across the British channel. No other water journey causes an equal amount of suffering. The most hardened traveler becomes seasick there. Fogs and heavy traffic are constantly causing collisions. Storms toss the small boats about like cockleshells. The submarine boat will remove all these objections. There will be no seasickness, because in a submerged boat there is no perceptible motion. There will be no smells to create nausea, for the boats will be propelled by electric power taken from storage batteries. There will be no collisions, because the boat will travel, coming and going, at different depths, say, one at 40, the other at 60 ft. The water overhead may be crowded with small craft, but the submarine boat will have a free, unobstructed course. She will be kept absolutely true to this course by means of cables running from shore to shore. On these cables will run automatic steering gear, attached to the submarine. Storms and fogs will have no existence for the traveler, for weather has little effect upon the water at the depth at which she moves."

"Tomorrow, if we had a fleet of submarines big enough, they could protect New York harbor against an attack by the combined fleets of the world. But our shipping and our city would still be at the mercy of the enemy, if they had only one submarine, manned by a fearless crew of experts. You could not mine against her, for she would counteract. You could not close the harbor against her, even with a network of torpedoes and chains stretched across the narrows, reaching from the surface to the bottom of the channel. From a safe distance she could send a torpedo against the network that would blow it to pieces, giving her all the passageway she wanted to go in and out. You could not chase her with a fleet of your own submarines, because you could not find her under water. How the menace of the submarine is to be met nobody has at this time been able to say. The genius of scores of inventors is groping with the problem, but so far without result. All are agreed, however, that in one direction at least she will forever remain unconquerable. She will make a close blockade impossible."

PROPOSED NEW SAULT RIVER CHANNEL.

Capt. Geo. P. McKay of Cleveland, chairman of the Lake Carriers' committee on aids to navigation, feels as a great many other vessel men feel, that even if appropriations were at hand to begin the work of deepening and widening parts of the west Nebish, so as to provide a second channel for deep draught vessels through the St. Mary's river, it would still be three or four years before such a waterway would be available. He therefore suggests a plan whereby a double route from the Dyke down to the mouth of the river may be provided at very little expense, if a little aid can be secured from the Canadian government, and whereby the great danger of blockade in the crowded part of the river known as Sailors' Encampment may be avoided. Capt. McKay would have the vessels use the Canadian channel to the eastward of St. Joseph's island, known as St. Joseph's channel and sometimes as the Owen sound route. In order to make this channel available, it would be necessary to make a cut to the eastward at the foot of Sugar island, but the distance would be only about a mile and the material very soft. The St. Joseph's channel has excellent depth of water, excepting in a few places, and it is hoped that the Canadian government may be induced to deepen and widen the waterway at these few points, as the cost would be slight compared with the advantages to be derived. Capt. McKay proposes to ask for opinions of the Canadian government officials on the subject.

A syndicate of New York bankers, represented by Charles H. Williams of No. 25 Broad street, has undertaken the reorganization of the Driggs-Seabury Gun & Ammunition Co. of Derby, Conn., the capital stock to be increased from \$1,000,000 to \$3,000,000. It is understood that the reorganized company will form the basis of a concern that will have a capital of about \$50,000,000. Providing the plans of the promoters are carried out it is announced that there will follow a union of interests that will be able to construct a naval vessel equipped from keel to turret.

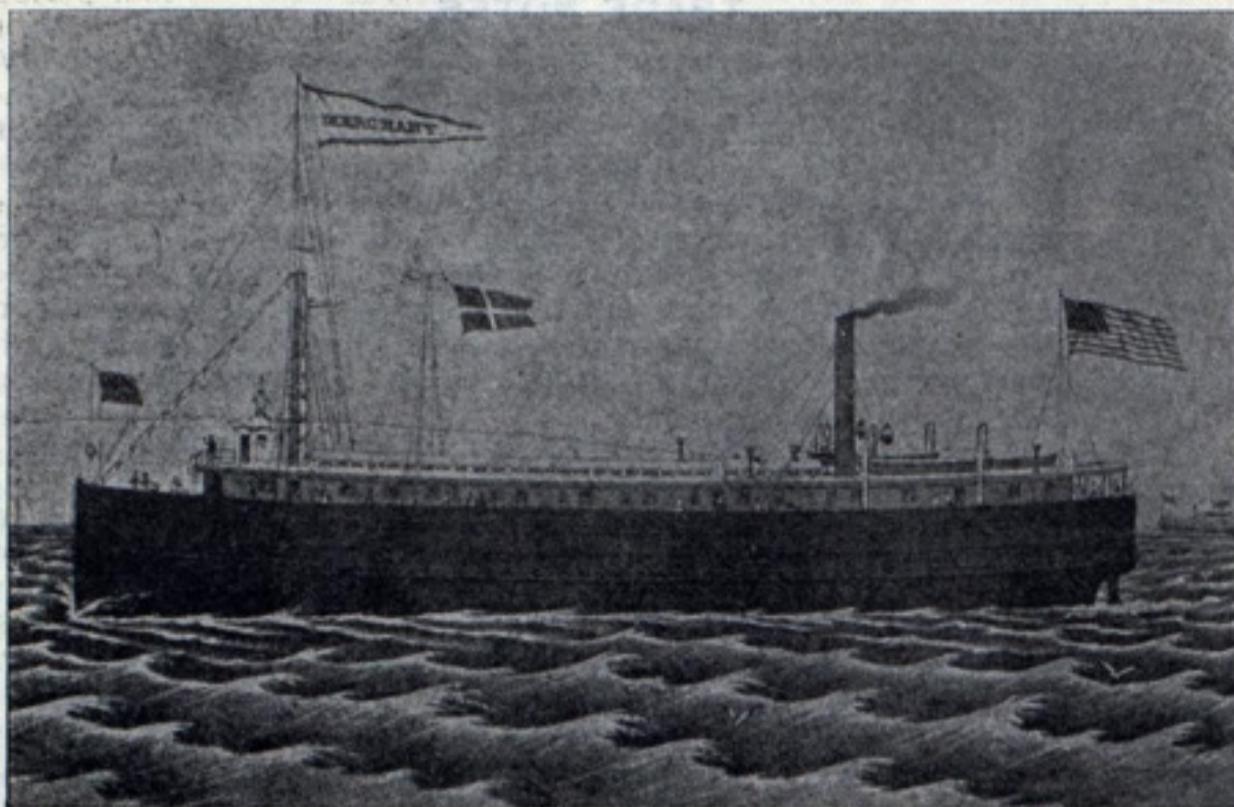
Stowe, Fuller & Co. of Cleveland have taken up the sale of what is known as R. I. W. damp resisting paint and composition, manufactured by Toch Bros. of No. 468 W. Broadway, New York. Toch Bros.' products are especially adapted to marine purposes. Mr. H. M. Toch has just returned to New York from a western trip and reports a marked increase in the sale of these specialties.

Mr. W. W. Watson, Jr., of Chicago, secretary of the Minnesota Iron Co., announces the following changes in officers of the company, effective April 27: C. P. Coffin is elected president, to succeed J. L. Greatsinger, resigned; Nelson P. Hulst is elected vice-president, to succeed Henry Seibert, resigned; W. W. Watson, Jr., is elected treasurer, to succeed C. P. Coffin, resigned.

An Ottawa dispatch says that the Canadian parliament has appropriated \$100,000 for widening and deepening the entrances to the canal at Sault Ste. Marie, Ont.

FIRST IRON CARGO VESSEL ON THE LAKES.

The Buffalo Express recently contained a sketch of David Bell, ship builder, which was interesting because it contained an account of the first merchant vessel of iron built on the great lakes. This was the propeller Merchant of 720 tons, the first cargo boat to burn coal under her boilers. The Merchant was begun by Mr. Bell in 1861 for J. C. & J. T. Evans and was completed in 1862. She was a success from the start. When built she was valued at \$90,000. She was lengthened in 1872 and her value thereby increased to \$120,000. In 1875 she struck on Racine reef and sank, becoming a total loss because the season was so far advanced that it was useless to try and raise her. From 1862 to 1875 she made 2,041½ trips,



Iron screw steamer Merchant, built in 1861.

and during that time she paid the underwriters for insurance on hull and eastbound freight \$154,535.80. The total amount on account of insurance during that period was \$143,913.25, leaving a profit to the underwriters of \$10,622.55. During the career of the Merchant she sank twice in Detroit river and once in a fog on Lake Michigan through striking on rocks and shoals. The Merchant during her life was a great money-maker, the freight on wheat from Chicago to Buffalo at that time being as high as 25 cents a bushel.

SHIP MASTER IN LAKE AND OCEAN TRAFFIC.*

Probably I can not do better in writing something for the Ship Masters' directory than to call the attention of members of the association to the fact that a radical change is now coming upon the character of their business, a change that will have an important influence upon the lives of many of them, and upon the world's opinion of the character and ability of men of the organization. I refer to the inauguration of lake and ocean traffic, which, starting in a tentative way with the despatch of four vessels to the Atlantic coasting trade this winter, may be said to have been fully inaugurated with the establishment of eight lake and ocean vessels during the present season. There is much discussion going on in shipping circles as to how the lake captains will take hold of the new duties they will necessarily have to assume in the fresh and salt water trade. It is generally admitted that they have few equals on salt water in the actual handling of vessels; in seamanship, pilotage and steam-boating they are admittedly superior; but how about the other duties of a salt water captain? Navigation they can readily learn; in fact, masters are coming to me in increasing numbers every day to take up the study of this science and, with few exceptions, they find it surprisingly easy. I presume it is because I have had occasion to find the extent of their knowledge that so many have asked me the questions indicated above.

In the early days of lake navigation a captain represented his owner. He had complete authority over the vessel, went from port to port as his judgment dictated, made her charters, incurred and paid her bills, and acted as manager ashore as well as captain afloat. At the end of the season he was generally able to show a profit that depended almost entirely upon his business ability and skill in his profession. With the rapid increase in civilization, telegraph and mail facilities, and the division of labor, shore work was taken more and more out of the captain's hands; all business was transacted for him by owners and their agents and he was simply required to report the arrival of his vessel, take their instructions as to unloading, and as soon as he was unloaded he found a cargo waiting for him. He was still an important man, however, as the safety and speed of the voyages depended entirely upon his seamanship and knowledge of the shores and bottoms of the various bodies of water he traversed. With the adoption of steam, the close survey of the lakes and the rapid establishment of beacons, buoys, marks and ranges, his duties have been gradually reduced to pilotage and the government of his crews. He has become the most skillful pilot in the world, but the remainder of his profession was rapidly becoming a lost art. Now he is suddenly called upon to practice his profession in its entirety, to retain all his old time skill upon the lakes and also compete with his salt water brethren in skill, in finesse, in knowledge of ports and customs and in daring, and people are asking me how he will manage his new responsibility.

They do not question his courage, or his ability to find his way safely from port to port; but how about his business sense? Has he the acumen and judgment to take charge of two or three hundred thousand dollars worth of tramp steamer and make a dividend on her? Let me give an instance: Two tramps arrived at a South American port, they

*An article by W. J. Wilson, principal of the Chicago Nautical School, in the Ship Masters' directory.

found a cargo to one port at a handsome freight; one of them took it and after discharging laid in harbor two weeks and then had to go 1,000 miles light before he could get another cargo. The other refused the proffered cargo and loaded for another port at a much lower freight; at the second port he readily got a cargo to New York, and from there to England, so that his vessel was earning all the time. Which was the best judgment? Then as to port charges and supplies; will he keep his bills down? These are questions that are in the minds of the average owner and capitalist today, and they are scrutinizing the membership of the Ship Masters' Association very closely on these lines, and questioning all who come intimately in contact with them.

For my part I believe the answer must, in the main, be favorable to the lake ship master. The question is one of education and men, chiefly of men. As to education, some of that must be acquired by the captain at his own expense and some at the expense of his owner, and that is why the owner is guessing. How much of this education has the owner got to pay for in the shape of experience for his captain, and how far will the captain's education and natural ability offset his lack of business experience if his owner puts the ship in the lake and Atlantic trade? He will have to meet chiefly the British and German tramps. They are captained very largely by men of inferior education and ability, who have grown up in the trade. Many of them started as boys before the mast and had little schooling and practically no shore life. The brightest and best educated are constantly called out for better positions in the line steamships, so that the average is kept rather low. The lake captains will be distinctly at a disadvantage in competition with the men of the liners, for they have the pick of the world to choose from. I am inclined, though, to think that they have not much to fear from the personnel of the smaller tramps. The lake captains are distinctly better educated than the men of the smaller tramps; their winters ashore have given them better business knowledge, and they are naturally acute and mentally vigorous. Many of them will fit themselves to hold their own from the beginning, so that the owner will have little to pay for if he selects his captain carefully.

NO SALVAGE FOR SEAMEN.

It would seem from a decree just entered in the case of the steamer C. F. Bielman by Judge Seaman of the United States district court, Milwaukee, that seamen are not entitled to become salvors, whatever may have been the peril or hardship or gallantry of their services in saving the ship or cargo. The suit is one in which vessel men have betrayed considerable interest and the decision is regarded as a very important one. The Bielman stranded last fall with a cargo of coal on Lake Michigan. Orders were sent ashore for a tug, lighter and men to unload part of the coal cargo and release the vessel. In the meantime bad weather came up and the crew was put to work throwing the cargo overboard, on the understanding with the master and mate, they claimed, that it was an insurance job and that they were to be paid 75 cents an hour. They worked night and day and at great peril. They were afterward refused special compensation!

In his decision Judge Seaman says it is important in the event of distress or shipwreck for seamen to exert themselves to the utmost of the ship, cargo and stores. Salvage service, says the court, can only be performed by persons not bound by legal duty to render them, and seamen are not entitled to become salvors no matter how great the peril or hardship. The situation was one that called for the utmost exertion on the part of the master and crew. If the master of the Bielman, under the stress of circumstances, promised the seamen better pay at the expense of the insurers the promise, Judge Seaman says, was unwarranted, as it merely called for the performance of an existing obligation, and at best was without consideration. "Therefore," continues the court, "while the proof preponderates in favor of the alleged promise of better pay, I am satisfied it can receive no judicial sanction as a binding agreement or as a discharge in any sense from the service of the ship."

SHIP BUILDING NOTES FROM THE PACIFIC.

The Tacoma Ship Building Co., Tacoma, Wash., was incorporated recently for the purpose of building and repairing ships. The city of Tacoma donated a site on the Puyallup river 400 ft. deep and with a water frontage of 975 ft. The site is less than a mile from the deep water anchorage of the harbor and is hard level ground that will require but little filling. The company has already secured a contract from the Charles Nelson Co., San Francisco, for a four-masted barkentine, 235 ft. over all, 41 ft. beam and 16½ ft. deep. In order to start upon the vessel at once it will be built upon land adjoining John B. Hardy's machine shop. The trustees of the new company are A. T. Stream, Joseph A. Sloan and John B. Hardy.

At Hoquiam, Wash., Geo. H. Hitchings is building at a cost of about \$90,000 a wooden steamer 206 ft. long, 38 ft. beam and 14½ ft. depth of hold for the Elkwood Lumber Co. of San Francisco. She is to have triple expansion engines with cylinders of 13½, 23 and 40 in. diameter, with a common stroke of 30 in., and two Scotch boilers of 10½ by 10½ ft. Furnaces are to be fitted for the use of oil as fuel. The steamer will engage in the Pacific coast lumber trade, carrying about 800,000 ft. Her owners expect to operate her very economically on account of the use of oil, which will be taken on in the lower part of California. Enough oil can be stored for fourteen days' run. It is estimated that the vessel will burn 2,000 gallons per day.

Mr. Hitchings is also building a four-masted schooner that is expected to carry about 700,000 ft. of lumber and which is to cost \$42,500.

The B. F. Sturtevant Co. of Boston, Mass., is rapidly recovering from the effects of the fire of April 14, which affected only the engine and electrical departments. With only a day's delay, incident to the renewal of belts, the remainder of the plant has been running as usual. Already a complete new equipment of improved machine tools is nearly installed in other buildings. As the Sturtevant company employs electric transmission for the driving of a considerable portion of its tools this work of installation has been a comparatively simple matter. Further delay in shipment of engine and electrical work is unlikely for no patterns or drawings were destroyed and the foundry, with a large stock of castings, is intact.

STEAM BOILER ECONOMY.

Mr. William Kent, associate editor of *Engineering News*, has written a book upon the subject "Steam Boiler Economy," a treatise on the theory and practice of fuel economy in the operation of steam boilers. In his preface he states the reason for writing the book as follows:

"In the year 1875 the author made his first evaporative test of a steam boiler. It was the Pierce rotating boiler, which was tested at the Centennial exhibition the following year. It had certain peculiarities of design which were supposed by the inventor to make it more efficient than any other boiler then on the market. The testing of this boiler and of two others during the same year led the author to study seriously the problem: 'On what conditions does the fuel economy of a steam boiler depend?' For three years, 1882-5, he was in the employ of the Babcock & Wilcox Co., and it was part of his work to make evaporative tests of the boilers made by that company, and of other kinds of boilers for comparison, in different sections of the country, and with all kinds of coal. In connection with his office practice from 1890 to the present time, he has had occasion to make nearly a hundred boiler tests, with different boilers, fuels and furnaces. Besides having this practical experience, together with the habit of studying critically the result of each test for the purpose of drawing conclusions from it, the author has been a constant student of the literature of the subjects of boiler testing and fuel economy, which from time to time appears in the transactions of engineering societies, in the technical press, in trade catalogues and in books. He has thus been enabled to compare theory with practice. Many books have been written on the subjects of boilers, furnaces and fuels, but in none of them does it seem that the problem of steam boiler economy has been treated with the thoroughness which its importance deserves. Most of the treatises on boilers devote the greater part of their space to details of construction, and only a small space to the subject of fuel economy. There appears to be a demand for a new book which shall treat solely of steam boiler economy and of subjects related thereto. To supply such a demand this book is offered.

TECHNICAL TRAINING IS REQUIRED.

The absolute necessity of thorough technical training as a foundation for the successful heating and ventilating engineer is clearly presented in a recent article by Prof. S. H. Woodbridge of the Massachusetts Institute of Technology, who says: "As an applied science, ventilation involves the movement of air through supply and discharge conduits, and either such effective diffusion of air within enclosures as to furnish air to and remove impurities from all their parts, or else such concentration of air movement as shall prevent the diffusion of impurities locally produced, and as shall effect their removal without diffusion through the enclosures. So considered, ventilation is a department of mechanics and mechanical engineering, a distinctly technical field. Without technical training, the questions of simple mechanics which are involved in such problems become mysterious in theory and vagaries in practice, and results become a

matter of chance rather than of precision. Ventilation deals with air, an invisible substance; with vitiation, and invisible impurity; with unseen motions; with motive forces often intangible; with courses of motion which are limited within invisible bounds. The field is a wide one for the play of fantasy in its mild and in its most erratic form. The capricious art can become an established science only in the hands of those who are too well grounded in the fundamental principles of ventilation involved to make it possible for them to entertain any theory, advance any explanation, or advocate any practice in matters of ventilation which is not clearly based on the demonstrable laws and well-known phenomena of the mechanics of gases, all of which demands a technical training of no mean order."

TRADE NOTES.

Owing to the determination of the United States Steel Corporation to concentrate all operating departments of the constituent plants at Pittsburgh, Charles M. Jarvis, vice-president in charge of the operating department of the American Bridge Co. has resigned, as Mr. Jarvis does not care to change his residence from New England.

The Bullock-Wagner sales organization has established a district office at No. 1624 Marquette building, Chicago. It will be in charge of Mr. H. B. Foster, who has for about two years served the Wagner company as sales agent. He will have the able assistance of Mr. E. W. Goldschmidt, formerly of the Western Electric Co. in covering this most important field.

The American Bridge Co. will furnish to the Illinois Central Railroad Co. all of the bridge work it will require during 1901. About 3,000 tons of steel will be used. The American company will also furnish to R. H. Hood & Co. the structural steel for the New York Central pier shed to be built on pier No. 59, North river, New York. About 1,000 tons of steel is involved in this latter order.

L. Boyer's Sons have lately removed to 90 Water street, New York, where they occupy the whole of the building. They are now building a boiler of 30 H.P. for the Chicago Telephone Co., to be used in a self-propelling pole derrick. They are also getting out drawings for two boilers to go into a yacht of 200 ft. length that is to make 25 knots an hour. Each of these boilers will have 67 sq. ft. of grate area and 3,100 sq. ft. of heating surface; weight of boiler, 28,725 lbs.; weight of water, 5,400 lbs.

Joseph T. Ryerson & Son of Chicago have issued a little booklet upon the subject of corrugated furnaces of the Morison suspension kind for land and sea. The advantages of the corrugated furnace boiler are enumerated as follows: It cannot get out of order; it is self-contained and portable; it is safe, sure, simple and durable; it will develop five horse power to every square foot of grate surface; it is economical in fuel, saving 15 to 25 per cent. of the usual coal bill; it is free from brick-setting, tie-rod stays and all troublesome complications; it has never been known to explode though more than 25,000 are in use in America and Europe.

**The facilities at our disposal
and our operative system are
such as to insure most favor-
able quotations and deliveries
for any part of the world.**

**American
A Bridge
Company**



ARTISTIC BRIDGE STRUCTURES.

THE SCHERZER ROLLING LIFT BRIDGE CO. RECEIVES CONTRACTS TO REPLACE SEVERAL SWING BRIDGES IN CHICAGO.

In removing the obstructions to navigation and the flow of water through the Chicago river, the trustees of the sanitary district of Chicago, who have this problem in charge, are pushing their work vigorously and as rapidly as the many obstacles to be overcome will permit. The first and probably the most important part of the work consists in the ultimate removal of the center pier swing bridges. The swing bridge at Taylor street has been entirely removed and replaced by a Scherzer rolling lift bridge, recently completed. The specially obstructive railroad bridge which is near the Taylor street bridge will be removed within a few months, as the new double track Scherzer rolling lift bridge of 275 ft. movable span will soon be completed and placed in service. Contracts have been awarded and work has commenced upon the new Scherzer bridges replacing the swing bridges at Canal and Main streets. Bids were submitted within the past day or two for a Scherzer bridge to replace the swing bridge at Randolph street.

The Scherzer company has also recently completed plans for a new bridge at State street to replace the present swing bridge, which was extremely obstructive to navigation, on account of a sharp bend in the channel of the river at the site of this bridge. The new bridge will give a clear, unobstructed channel for navigation 140 ft. wide. The movable span, center to center of bearings, will be 161 ft. 8 in. The roadways, center to center of trusses, will be 40 ft. 6 in. wide, with two sidewalks each 11 ft. wide. As State street is the principal retail business street of the city of Chicago, and the bridge is near the business center, it was decided to make the outlines of the new bridge as artistic as possible without increasing the present cost of the structure. The bottom chord is arched and the top chord projects but slightly above the roadway, thus giving a deck bridge with an unobstructed view. The new bridge when completed will not only facilitate navigation, but will present a striking contrast to the present unsightly swing bridge. The bridge without extra cost for ornamentation will be in harmony with the growing demand for more artistic bridge structures at Chicago. The bridge is so designed that appropriate ornamentation may be added at any time in the future when funds are available for such purpose. Plans have also been completed for new Scherzer rolling lift bridges to replace the swing bridges at Harrison street and Eighteenth street, and within a few weeks the Scherzer company will have completed plans for a new bridge to replace the swing bridge at Polk street. All of the above new bridges will give an unobstructed channel of 140 ft. in width, or wide enough to pass side by side two of the largest lake or ocean vessels likely to enter the harbor of Chicago for many years to come. The wide channels provided will enable vessels to pass these bridges very rapidly, and time

will also be saved, as all the bridges are designed to be operated by electricity and may be opened or closed within thirty seconds.

As soon as these bridges are completed and placed in service, the work of removing the other obstructive swing bridges can be proceeded with, without unduly obstructing the street traffic across the bridges. After all the swing bridges have been removed and replaced by the more modern type of bascule bridge and the obstructive tunnels have been lowered or removed, the largest lake vessels can readily and rapidly reach any point along the fifty-six miles of dock frontage comprising the present internal harbor of Chicago, and the delays heretofore caused by the slow passage of the vessels through the narrow openings provided by the old swing bridges will be obviated. The highway traffic will also be greatly facilitated, as the present comparatively small and frequent vessels will be replaced by larger vessels, less frequent but carrying a larger tonnage. The large, comprehensive plan under which the harbor improvements at Chicago are now being executed so vigorously indicate that Chicago will not only retain all of its present large marine commerce, but that it will also be prepared for the larger vessels and great increase of marine commerce certain to follow the completion of an adequate ship waterway within the United States, either to the Gulf of Mexico or to the Atlantic ocean.

"A Sailor's Log; Recollections of Forty Years of Naval Life," is the title of a book by Rear Admiral Robley D. Evans. The book is really an autobiography of the rear admiral's life and is most entertainingly written. Most autobiographies lack cohesion, but Evans tells a succinct and well connected story. His life has been crowded with adventure. He was wounded in the civil war, he was in charge of the gunboat Yorktown during the affair with Chili, and was in command of the Iowa during the engagement off Santiago. Altogether he has had his share of experiences.

A tramp steamer, the Lyra, building for the Boston Towboat Co., was launched from the yards of the Maryland Steel Co. last week. She is a sister of the Hyades and Pleiades which were built at this yard last year. Besides these the Boston company will have two other tramps when the big steamers now on the ways are completed. The launch was made the occasion for the gathering of quite a number of distinguished men. The Review will describe and illustrate this vessel later.

Anywhere and return for \$1.00—The Nickel Plate road announces to the public that on Sunday, May 5, it will inaugurate its usual summer Sunday excursions for parties of five or more traveling together on one ticket between any two stations on its line within a distance of 100 miles; the cost for which for each individual will be but \$1.00. Organize your parties of five or more and enjoy a Sunday outing on the Nickel Plate road. Write, wire, 'phone or call on nearest agent, or address E. A. Akers, C. P. & T. A., Cleveland, O.

57, May 15.

BELLEVILLE GENERATORS

Grand Prix 1889
Originated 1849

Hors Concours 1900
Latest Improvements 1896

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890.....	67,728	2,460										
1891.....	68,247	68,331	204									
1892.....	68,247	68,403	69,822	23,259								
1893.....	68,379	68,343	68,286	68,247								
1894.....	68,439	68,367	68,574	68,439	37,701							
1895.....	68,673	68,766	68,739	68,808	40,887	28,713						
1896.....	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897.....	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898.....	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899.....	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900.....	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total.....	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

ATELIERS ET CHANTIERS DE L'ERMITAGE, À ST. DENIS (SEINE), FRANCE.
WORKS AND YARDS OF L'ERMITAGE AT ST. DENIS (SEINE), FRANCE.

TELEGRAPHIC ADDRESS: BELLEVILLE, SAINT-DENIS-SUR-SEINE.

LAUNCH OF THE CONSTITUTION.

The America's cup defender Constitution was launched at Herreshoff's yards at Bristol on Monday evening. It was said that the launch took place in the dark in order that no photographs might be taken of it. The Constitution is said to be a boat of remarkable grace and beauty. In many respects she greatly resembles the Columbia, but Capt. Nat Herreshoff has made many improvements and his new candidate for cup honors gives promise of being more wonderful than the Columbia, in which many thought he had reached the limit of speed. With the new method of construction adopted by the Bristol genius, however, the Constitution is many tons lighter than the Columbia and a little flatter floor and extra beam will enable her to carry a large spread of canvas. As she rested on the cradle ready to slip into the water she seemed the perfection of strength, a marvel of lightness and a beauty of gentle curves and fair lines. Her water line length is near to 90 ft., the limit of her class. Her length over all is the same as the Columbia's, 132 ft. Her sheer and freeboard do not show departure sufficiently great to be perceptible to the most critical eye. Her beam is 25 ft. 2 in., or 1 ft. more than the Columbia, and her draught is 20 ft., which is the same as that of the older yacht. The midship section shows more power than the Columbia's and the yacht gains here the stability necessary to enable her to carry the big rig designed for her.

The bilges show the same, smooth easily rounded lines, from which the boats from Herreshoff's boards are famous. These lines are slightly fuller and the floor flatter than the Columbia's. The greatest beam of the yacht is just aft the midship section, which is much further aft than that of the challenger, Shamrock II. The side deck line of the Constitution appears to be slightly fuller than the Columbia's from the midship section

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In Liquid and Paste Form.

Will Polish

Hot or Cold

Metal,

no matter which.

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We know that we can be of service to you if you will write us your wants as regards PACKINGS for your valve rods, pistons, etc. We are the manufacturers of

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THE GARLOCK PACKING CO.

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FOR CONDENSER TUBES

Benedict & Burnham Mfg. Co., Mills and Offices, Waterbury Conn.
New York, 253 Bd'wy.
Boston, 172 High St.

Contains NO ZINC
nor any weakening metal.
Send for Booklet with
treatise on "Electrolysis
of Condenser Tubes."

forward and she is a little wider at the taffrail, thus giving an easier turn to the frame and lengthening and broadening the floor on which she sails.

Regarding the wetted surface, there seems to be no appreciable difference between the Constitution and Columbia, which means that, with the same surface and with increased stability, the new boat will be driven through the water at a greater speed than the Columbia was. The lead keel of the Constitution is the same as that of the Columbia, the lead having been run in the keel used for the 1899 boat. The sail area of the boat will be about 14,300 sq. ft. The boom and bowsprit are both larger than those of the Columbia, and the mast is stepped 1½ ft. further aft, so that on the base line the Constitution will measure over 187 ft. The mast is 2 ft. longer than the Columbia's and does not bury so deep in the step. The topmast and gaff are both several feet longer than the Columbia's. The truck will be 145 ft. above the decks.

CONSOLIDATING CANADIAN STEEL COMPANIES

According to a Philadelphia dispatch, officers of the Ontario Lake Superior Co. and the Consolidated Lake Superior Co. have issued a plan for consolidating the two companies. There will be a meeting of the stockholders of the Consolidated Lake Superior Co. in New Haven, Conn., on May 16, to approve the plan. The plan proposes to increase the capital stock of the Consolidated Lake Superior Co. to \$117,000,000, of which \$35,000,000 will be non-cumulative 7 per cent. preferred and \$82,000,000 common stock. The par value of each share of the stock will be changed from \$50 to \$100, and the stock of the Ontario company acquired by giving \$125 par value of the new consolidated preferred stock for \$100 of Ontario preferred and \$200 of the new common stock for \$100 of the Ontario common stock. Dividends of 25 per cent. on preferred and 10 per cent. on the common stock of the present Consolidated company will be declared, raising the values of the present holdings by those amounts, following which the \$50 shares now held will be exchanged for \$100 shares to an equal amount. Any balance is to be used to enlarge the plant being constructed at Sault Ste. Marie, Ont., to the capacity of 2,500 tons daily.

A number of very complete outfits of driving machinery and boat equipment, accompanied by plans and specifications for building the hull and installing the machinery, have been sent out by the Marine Iron Works, station A, Chicago. Several similar contracts now under way. This is a plan that they have demonstrated to be an exceptionally good one, particularly for those located at a distance where they may have suitable material and good men to do the work, provided they secured the necessary information with plans and details, all of which the Marine Iron Works furnish with their complete machinery outfits when so contracted for.

Joshua Rhodes former chairman of the National Tube Co. has confirmed the report that the United States Steel Corporation intends to dismantle many of its plants and centralize them in the most available districts. It is estimated that this policy will bring into the Pittsburgh district 50,000 workmen who will live within thirty miles of town.

The office and business of the Wright Mfg. Co., manufacturers of high grade steam specialties, Cleveland, have been removed to Detroit, where the business of the company will hereafter be transacted.

FOR SALE OR CHARTER.

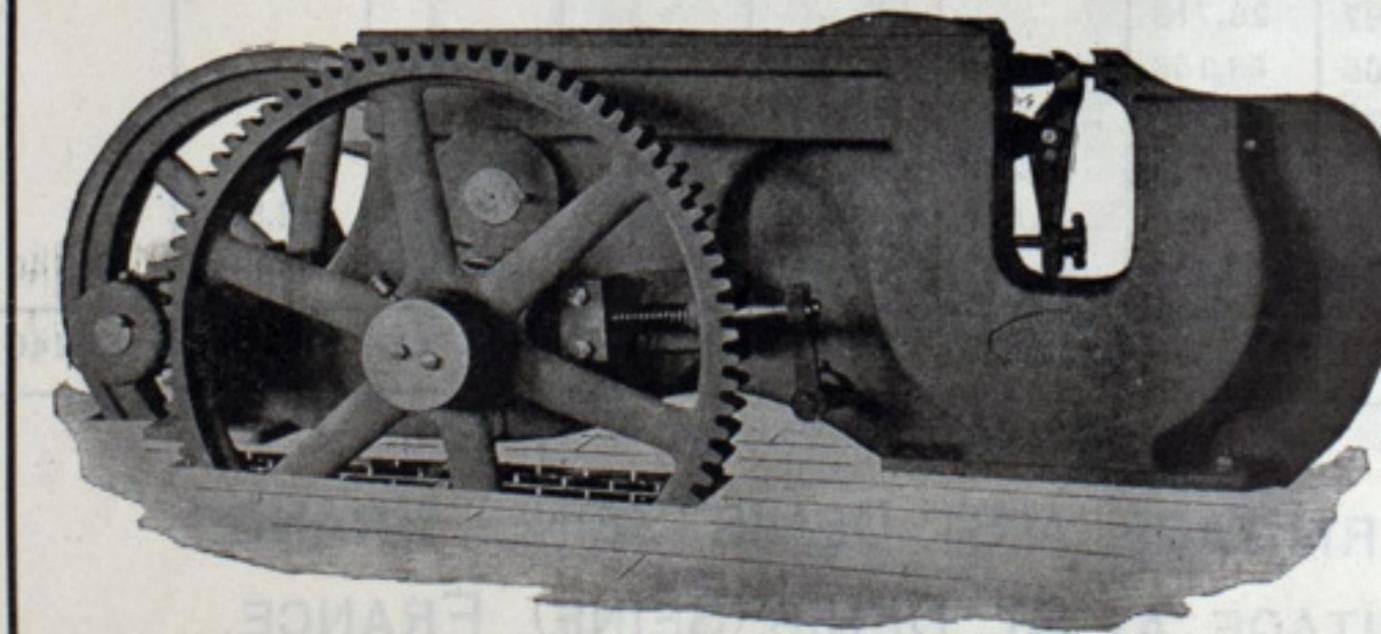
First-class British steamers, of Welland canal dimensions; about 3,250 gross tons capacity, carrying about 2,000 gross tons on 14 ft. (fresh water) draught. Speed 10 knots loaded; easy consumption. Large hatchways. For further particulars address "Charter," The Marine Review Pub. Co., Perry-Payne Bldg., Cleveland, Ohio.

May 30.

U. S. Engineer Office, Jones Building, Detroit, Mich., May 6, 1901. Sealed proposals for dredging, and other work required for removing obstructions to navigation in main Ship Channel between head of St. Clair and mouth of Detroit rivers, will be received here until 12 noon (Standard time), May 28, 1901, and then publicly opened. Information furnished on application. G. J. Lydecker, Lt. Col., Engrs.

May 23.

THIS ILLUSTRATES OUR



HORIZONTAL PUNCH

which is a very useful tool in any shop, and is especially designed for punching angles, channels, beams, and flanges of boiler heads. This punch is equipped with our regular punching attachment and automatic stop, and is built in several sizes of throat from 6 in. to 40 in., with capacities from $\frac{1}{8}$ -in. hole through $\frac{1}{8}$ -in. plate to 1 $\frac{1}{4}$ -in. hole through 1-in. plate. We can satisfy you that we have the best horizontal punch on the market, and will be pleased to correspond with you if you are in need of such a machine.

The Cleveland Punch & Shear Works Co., CLEVELAND, O.
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"Seaboard Steel Castings."

MANUFACTURERS OF
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OPEN-HEARTH STEEL CASTINGS
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MACHINE WORK AND PATTERNS
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CAPACITY, 1500 TONS PER MONTH

Seaboard Steel Casting Co.,
CHESTER, PA.

Treasury Department, Office of General Superintendent U. S. Life-Saving Service, Washington, D. C., May 4, 1901. Sealed proposals will be received at this office until 2 o'clock p. m. of Friday, the 31st day of May, 1901, and then publicly opened, for furnishing supplies required for use of the Life-Saving Service for the fiscal year ending June 30, 1902; the supplies to be delivered at such points in New York City, Grand Haven, Mich., and San Francisco, Cal., as may be required, and in the quantities named in the specifications. The supplies needed consist of Beds and Bedding; Blocks and Sheaves; Cordage; Crockery; Furniture; Hardware; Lamps, Lanterns, etc.; Lumber; Medicines, etc.; Paints, Oils, etc.; Ship Chandlery; Stoves, etc.; Tools, and Miscellaneous Articles; all of which are enumerated in the specifications attached to the form of bid, etc., which may be obtained upon application to this office, or to the Inspector of Life-Saving Stations, 17 State Street, New York City; Superintendent Twelfth Life-Saving District, Grand Haven, Mich.; and Superintendent Thirteenth Life-Saving District, New Appraisers' Stores, San Francisco, Cal. Envelopes containing proposals should be addressed to the "General Superintendent U. S. Life-Saving Service, Washington, D. C." and marked on the outside "Proposal for Annual Supplies." The right is reserved to reject any or all bids, and to waive defects, if deemed for the interest of the Government. S. I. Kimball, General Superintendent.

May 16

U. S. Engineer Office, Cincinnati, O., April 27, 1901. Sealed proposals for building 500 feet length of Chanoina dam of navigable pass at Dam No. 4, Ohio River, will be received here until 2 p. m., June 4, 1901, and then publicly opened. Information furnished on application to Wm. Martin, Resident Engineer, Davis Island Dam, Bellevue, Pa., or to this office. Wm. H. Bixby, Maj., Engrs. May 23.

FOR SALE.

BALANCED COMPOUND MARINE ENGINES carried in stock for immediate delivery—20 to 200 horse power. Full line of patterns for larger sizes and quadruple expansion engines, insuring quick delivery. Highest economy and speed.

NO VIBRATION. Contracts taken for complete plants.

July 25. **WELLS ENGINEERING CO., 136 Liberty St., NEW YORK, N. Y.**

STEAM YACHT (Screw Schooner) FOR SALE.

Dimensions: Over all, 73 ft. 1 in.; water line 63 ft. 7 in.; beam, 12 ft. 3 in. Vertical steeple-compound condensing engines, 10 and 20 by 12 in. Seabury boiler. Accommodations in cabin for four persons. All furnishings complete, ready for cruising. Price, \$7,500. Box 2275, Boston, Mass.

May 9.

LUMBER SCHOONER FOR SALE.

A first-class lumber schooner of 275,000 ft. capacity cheap for cash. Address Wm. E. Barrett & Co., Grand Rapids, Mich. May 9.

One cent a mile to the Pan-American Exposition at Buffalo via the Nickel Plate road on May 15 and 29. Train leaves Bellevue, O., at 12:15 midnight, leaving Cleveland at 2:06 a. m., and arriving at Buffalo at 7:35 a. m. Tickets are good returning within three days on any one of our peerless express trains where scheduled to stop. For rates and time of train at intermediate stations see bill, call on nearest agent or address C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O.

49, May 29.

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MANUFACTURERS OF

Seamless Cold Drawn Steel Tubing

IN ALL SIZES FROM $\frac{1}{8}$ TO 16" DIAMETER.

Stay Tubes,
Water Grates,
Compressed Air and
High Steam Pressures.

Boiler Tubes
FOR ALL CLASSES
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To prevent pitting, neutralize the oil, stop incrustation, and as a perfect preservative to the iron, boiler, and all its connections—especially prepared for the marine trade of the lakes.

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Analyzers of Everything.

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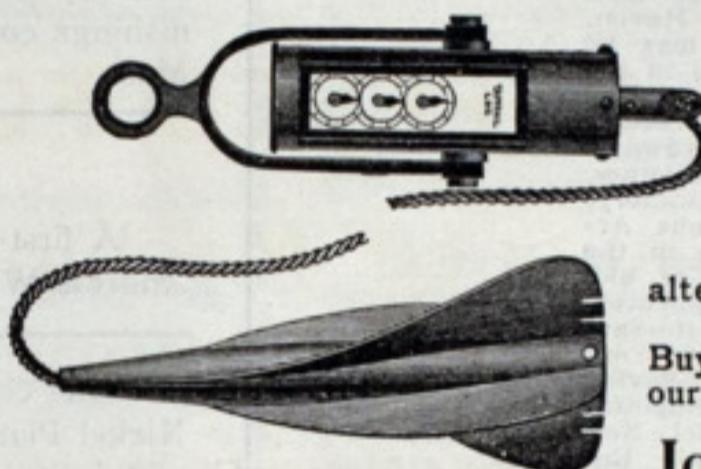
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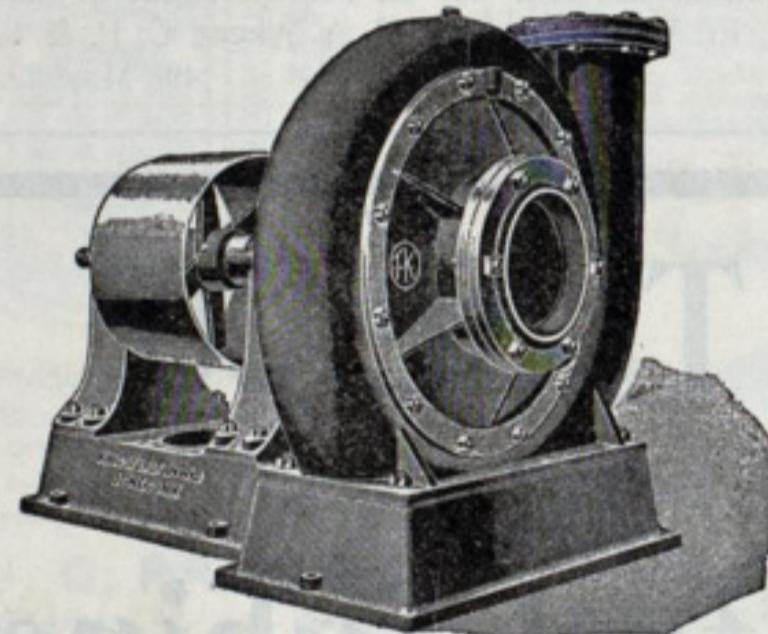
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Marine Boilers.

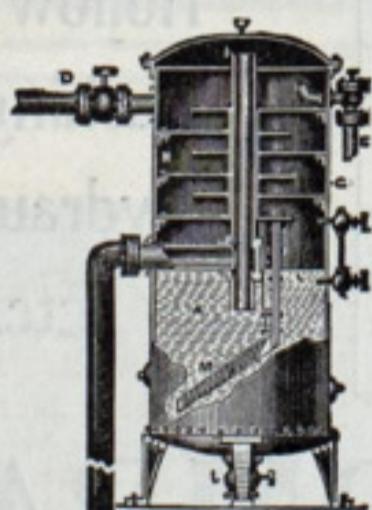
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KEEP YOUR BOILERS CLEAN

BY USING
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The "BUFFALO" is Warranted to Remove all Sediment and
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FEED WATER
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IT ADDS YEARS TO THE
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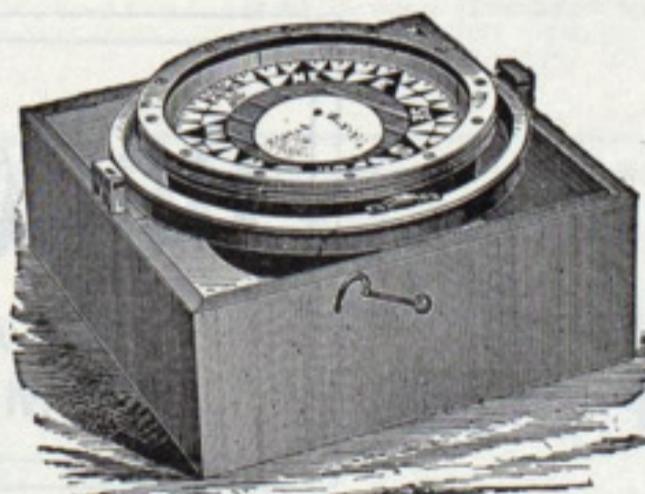
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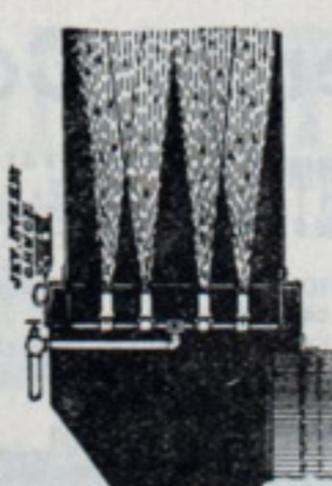
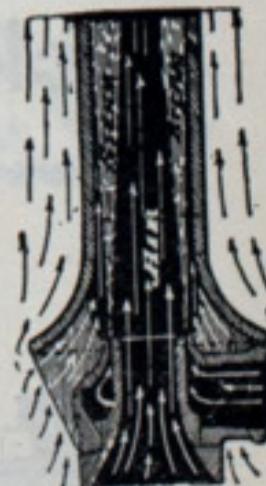
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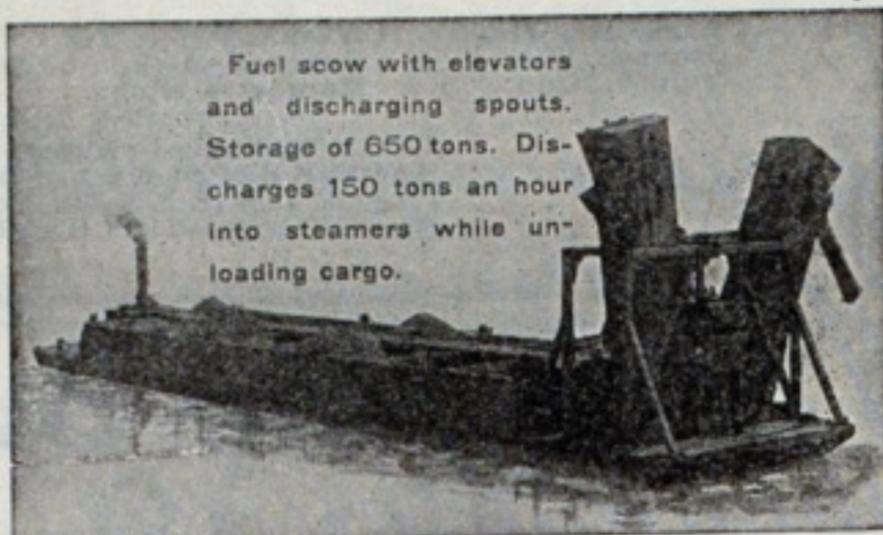
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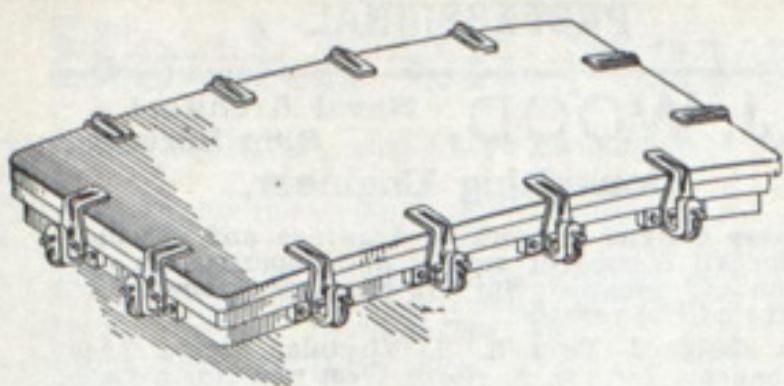
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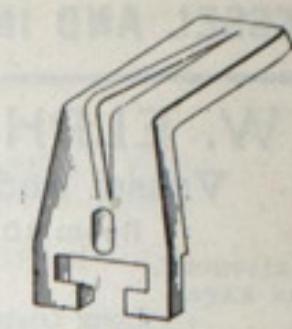
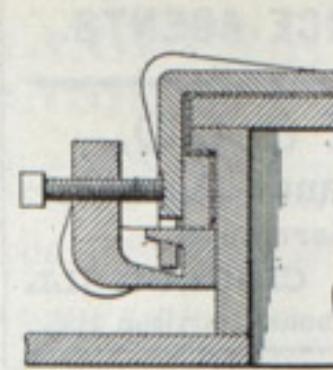
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Hardy, John B. Tacoma, Wash.
Harlan & Hollingsworth Co. Wilmington, Del.
Hodge, S. F. & Co. Detroit.
Jenks Ship Building Co. Port Huron, Mich.
Kingsford Foundry & Machine Works. Oswego, N. Y.
MacKinnon Mfg. Co. Bay City, Mich.
Maryland Steel Co. Sparrow's Point, Md.
Moran Bros. Co. Seattle, Wash.
Neafie & Levy Ship & Engine Building Co. Philadelphia.
Newport News Ship Building Co. Newport News, Va.
Nixon, Lewis. Elizabeth, N. J.
Pusey & Jones Co. Wilmington, Del.
Risdon Iron Works. San Francisco.
Roberts Safety Water Tube Boiler Co. New York.
Stirling, The Co. Chicago.
Trigg, Wm. R. Co. Richmond, Va.
Union Iron Works. San Francisco.
Willard, Chas. P. & Co. Chicago.

BOILER COMPOUNDS.

Dearborn Drug & Chemical Works. Chicago.

BOILER FURNACES, FIRE FRONTS, ETC.

Continental Iron Works. New York.

BOILER RIVETS.

Bourne-Fuller Co. Cleveland.
Champion Rivet Co. Cleveland.

BOILER STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co. Cuyahoga Falls, O.

BOLT CUTTERS.

Niles Tool Works Co. Hamilton, O.

BORING AND TURNING MILLS.

Niles Tool Works Co. Hamilton, O.

BRASS AND BRONZE CASTINGS.

Cramp, Wm. & Sons. Philadelphia.
Illinois Smelting & Refining Works. Chicago.
Phosphor Bronze Smelting Co. Philadelphia.

BRIDGES, BUILDERS OF.

American Bridge Co. New York.
Scherzer Rolling Lift Bridge Co. Chicago.

BUCKETS, ORE AND COAL.

Brown Hoisting & Conveying Machine Co. Cleveland.
McMyler Mfg. Co. Cleveland.

CABIN AND CABINET FINISHING WOODS.

Martin-Barriss Co. Cleveland.

CAPSTANS.

American Ship Windlass Co. Providence, R. I.
Hyde Windlass Co. Bath, Me.

CHAINS.

Monongahela Iron & Steel Co. Pittsburgh.
Newhall Chain Forge & Iron Co. New York.
Standard Chain Co. Pittsburgh.

CHAIN HOISTS.

Boston & Lockport Block Co. Boston, Mass.

CHUCKING MACHINES.

Niles Tool Works Co. Hamilton, O.

CHUCKS FOR LATHES, DRILLS AND PLANERS.

Skinner Chuck Co. New Britain, Conn.

CIRCULATOR, EQUILIBRIUM, with Steam Heating Attachment.

Bloomsburg & Co., H. Newport News, Va.

CLOCKS (Marine), CHRONOMETERS, BELLS.

Ashton Valve Co. Boston.
Bliss, John & Co. New York.
Ritchie, E. S. & Sons. Brookline, Mass.

COAL PRODUCERS AND SHIPPERS.

Castner, Curran & Bullitt. Philadelphia.
Hanna, M. A. & Co. Cleveland.
Ohio Fuel Co. Cleveland.
Pickands, Mather & Co. Cleveland.
Pittsburg Coal Co. Cleveland.
Rochester & Pittsburgh Coal & Iron Co. Buffalo.
Scott Co., The W. L. Erie, Pa.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting Machinery Co., Incorporated. Cleveland.
Lidgerwood Mfg. Co. New York.
McMyler Mfg. Co. Cleveland.

COMPASSES.

Bliss, John & Co. New York.
Ritchie, E. S. & Sons. Brookline, Mass.

COMPASS ADJUSTER.

Fields, J. M. Cleveland.

CORK JACKETS AND RINGS.

Armstrong Cork Co. Pittsburgh, Pa.
Kahnweiler's Sons, D. New York.
Lane & DeGroot. Brooklyn.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting Machinery Co., Incorporated. Cleveland.
General Electric Co. Schenectady, N. Y.
Lidgerwood Mfg. Co. New York.
McMyler Mfg. Co. Cleveland.
Westinghouse Electric & Mfg. Co. Pittsburgh.

CRANK PINS.

Cleveland City Forge & Iron Co. Cleveland.

DIVING APPARATUS.

Hale Rubber Co., Alfred. So. Boston, Mass.

DOORS—PNEUMATIC AND ELECTRIC SAFETY POWER DOORS AND HATCHES.

"Long Arm" System Co. Cleveland.

DRILL PRESSES—DRILLS OF ALL KINDS.

Cleveland Punch & Shear Works Co. Cleveland.
Niles Tool Works Co. Hamilton, O.

DRYING APPARATUS.

American Blower Co. Detroit.
Boston Blower Co. Hyde Park, Mass.
Sturtevant, B. F. Co. Boston.

DRILLS, PNEUMATIC.

Standard Pneumatic Tool Co. Chicago.

DRY DOCKS.

American Ship Building Co. Cleveland.
Bath Iron Works, Ltd. Bath, Me.
Buffalo Dry Dock Co. Buffalo.
Chicago Ship Building Co. Chicago.
Craig Ship Building Co. Toledo, O.
Cramp, Wm. & Sons. Philadelphia.
Detroit Shipbuilding Co. Detroit.

Harlan & Hollingsworth Co. Wilmington, Del.
Lockwood Mfg. Co. East Boston, Mass.
Maryland Steel Co. Sparrow's Point, Md.
Moran Bros. Co. Seattle, Wash.
Newport News Ship Building Co. Newport News, Va.
Nixon, Lewis. Elizabeth, N. J.
Pusey & Jones Co. Wilmington, Del.
Shipowners Dry Dock Co. Chicago.
Townsend & Downey Ship Bldg. Co. New York.
Union Iron Works. San Francisco.

ELECTRIC AUTOMATIC WHISTLE OPERATORS.

Signal & Control Co. New York.

ELECTRIC LIGHT AND POWER PLANTS.

Buffalo Forge Co. Buffalo.
Bullock Electric Mfg. Co. Cincinnati.
Electro-Dynamic Co. Philadelphia.
Elwell-Parker Electric Co. Cleveland.
General Electric Co. Schenectady, N. Y.
Seidler-Miner Electric Co. Detroit.
Sturtevant, B. F. Co. Boston.
Westinghouse Electric & Mfg. Co. Pittsburgh, Pa.

ELECTRIC HOISTS AND CRANES.

Bullock Electric Mfg. Co. Cincinnati.
Elwell-Parker Electric Co. Cleveland.
General Electric Co. Schenectady, N. Y.
Lidgerwood Mfg. Co. New York.
Westinghouse Electric & Mfg. Co. Pittsburgh, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co. Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co. Cleveland.
Atlantic Works. East Boston, Mass.
Bath Iron Works, Ltd. Bath, Me.
Chicago Ship Building Co. Chicago.
Chase Machine Co. Cleveland.
Craig Ship Building Co. Toledo, O.
Cramp, Wm. & Sons. Philadelphia.
Detroit Shipbuilding Co. Detroit.
Farrar & Trefts. Buffalo.
Fletcher, W. & A. Co. Hoboken, N. J.
Fore River Ship & Engine Co. Quincy, Mass.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated. New York.
Hardy, John B. Tacoma, Wash.
Harlan & Hollingsworth Co. Wilmington, Del.
Hodge, S. F. & Co. Detroit.
Jenks Ship Building Co. Port Huron, Mich.
Lake Shore Engine Works. Marquette, Mich.
Lockwood Mfg. Co. East Boston, Mass.
MacKinnon Mfg. Co. Bay City, Mich.
Maryland Steel Co. Sparrow's Point, Md.
Moran Bros. Co. Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co. Philadelphia.
Newport News Ship Building Co. Newport News, Va.
Nixon, Lewis. Elizabeth, N. J.
Olds Motor Works. Detroit.
Pusey & Jones Co. Wilmington, Del.
Risdon Iron Works. San Francisco.
Roach's Ship Yard. Chester, Pa.
Sheriffs Mfg. Co. Milwaukee.
Trigg, Wm. R. Co. Richmond, Va.
Trout, H. G. Buffalo.
Union Iron Works. San Francisco.
Willard, Chas. P. & Co. Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son. New York.
Electro-Dynamic Co. Philadelphia.
Seidler-Miner Electric Co. Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane & Co. Chicago.
Reilly Repair & Supply Co., James. New York.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co. Philadelphia.
Hunt, Robt. W. & Co. Chicago.
Miller, Walter. Cleveland.
Pittsburgh Testing Laboratory, Ltd. Pittsburgh.
Powell, Ambrose V. Chicago.
See, Horace. New York.
Wood, W. J. Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James. New York.

FANS FOR VENTILATION, EXHAUST, ETC.

American Blower Co. Detroit.
Boston Blower Co. Hyde Park, Mass.
Buffalo Forge Co. Buffalo.
Sturtevant, B. F. Co. Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert. Buffalo.
Reilly Repair & Supply Co., James. New York.
Reynolds, H. J. Cleveland.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co. Boston.
Porter's Sons' Co., Wm. New York.

FORGES.

Buffalo Forge Co. Buffalo.
Sturtevant, B. F. Co. Boston.

FORGINGS.

Bourne-Fuller Co. Cleveland.
Cleveland City Forge & Iron Co. Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FURNACES FOR BOILERS.

Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.

Castner, Curran & Bullitt (Pocahontas).....Philadelphia.

Hanna, M. A. & Co.....Cleveland.

Ohio Fuel Co.....Cleveland.

Pickands, Mather & Co.....Cleveland.

Pittsburg Coal Co.....Cleveland.

Rochester & Pittsburgh Coal & Iron Co.....Buffalo.

Scott Co., The W. L.....Erie, Pa.

Smith, Stanley B. & Co.....Detroit.

Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.

Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.

Lake Shore Engine Works.....Marquette, Mich.

McMyler Mfg. Co.....Cleveland.

Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.

American Steam Gauge Co.....Boston.

Ashton Valve Co.....Boston.

Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

GRAPHITE BUSHINGS AND BEARINGS.

Graphite Lubricating Co.....Bound Brook, N. J.

HAMMERS, PNEUMATIC.

Standard Pneumatic Tool Co.....Chicago.

HAMMERS, POWER DROP.

Chase Machine Co.....Cleveland.

Niles Tool Works Co.....Hamilton, O.

HATCH FASTENERS.

Mulholland, M.....Cleveland.

HATCH GEARS.

"Long Arm" System Co.....Cleveland.

HAWSERS, WIRE.

American Steel & Wire Co.....Chicago.

HEATING APPARATUS.

Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.

American Ship Building Co.....Cleveland.

Brown Hoisting Machinery Co., Incorporated.....Cleveland.

Chase Machine Co.....Cleveland.

Elwell-Parker Electric Co.....Cleveland.

General Electric Co.....New York.

Hodge, S. F. & Co.....Detroit.

Hyde Windlass Co.....Bath, Me.

Lidgerwood Mfg. Co.....New York.

McMyler Mfg. Co.....Cleveland.

Marine Iron Co.....Bay City.

Westinghouse Electric & Mfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.

Sayen & Schultz.....Philadelphia.

INDICATORS FOR STEAM ENGINES.

American Steam Gauge Co.....Boston.

Ashton Valve Co.....Boston.

Crosby Steam Gage & Valve Co.....Boston.

IGNITERS FOR GAS ENGINES.

Holtzer-Cabot Electric Co.....Brookline, Mass.

INJECTORS.

Crane Co.....Chicago.

Jenkins Bros.....New York.

INSURANCE, MARINE.

Brown & Co.....Buffalo.

Drake & Maytham.....Buffalo.

Elphicke, C. W. & Co.....Chicago.

Hawgood & Moore.....Cleveland.

Helm, D. T. & Co.....Duluth, Minn.

Hutchinson & Co.....Cleveland.

Keith, J. G. & Co.....Chicago.

La Salle & Co.....Duluth.

Mitchell & Co.....Cleveland.

Osborn, F. H. & Co.....Chicago.

Parker, A. A. & W. B.....Detroit.

Peck, Chas. E. & W. F.....New York and Chicago.

Richardson, W. C.....Cleveland.

Sullivan, D. & Co.....Chicago.

IRON ORE AND PIG IRON.

Bourne-Fuller Co.....Cleveland.

Hanna, M. A. & Co.....Cleveland.

Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.

Niles Tool Works Co.....Hamilton, O.

LAUNCHES—NAPHTHA, ELECTRIC.

Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.

Armstrong Cork Co.....Pittsburg.

Drein, Thos. & Son.....Wilmington, Del.

Kahnweiler's Sons, D.....New York.

Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.

Page Bros. & Co.....Boston.

Porter's Sons' Co., Wm.....New York.

LOGS.

Walker & Son, Thomas.....Birmingham, Eng.

Also Ship Chandlers.

MACHINE TOOLS.

Niles Tool Works Co.....Hamilton, O.

MACHINE TOOLS (WOOD WORKING).

Fay & Egan Co., J. A.....Cincinnati, O.

Atlantic Works, Inc.....Philadelphia.

MALLETS FOR CAULKERS, BOILER MAKERS, ETC.

N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF

Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.

Fogg, M. W.....New York.

MECHANICAL DRAFT FOR BOILERS.

American Blower Co.....Detroit.

American Ship Building Co.....Cleveland.

Boston Blower Co.....Hyde Park, Mass.

Bloomsburg & Co., H.....Newport News, Va.

Buffalo Forge Co.....Buffalo.

Detroit Shipbuilding Co.....Detroit.

Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.

Katzenstein, L. & Co.....New York.

U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.

Cramp, Wm. & Sons.....Philadelphia.

Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.

Bertram's Oil Polish Co.....Boston, Mass.

Paul & Co., J. C.....Chicago.

MILLING MACHINES OF ALL KINDS.

Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.

Bliss, John & Co.....New York.

Ritchie, E. S. & Sons.....Brookline, Mass.

NAVAL ARCHITECTS.

See, Horace.....New York.

Wood, W. J.....Chicago.

OAKUM.

Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.

Dixon Crucible Co., Joseph.....Jersey City, N. J.

Standard Oil Co.....Cleveland.

OUTFITTING OF VESSELS—CARPETS, FURNITURE, ETC.

Sterling, Welch & Co.....Cleveland.

Williams & Rodgers Co.....Cleveland.

PACKING.

Crane Co.....Chicago.

Garlock Packing Co.....Palmyra, N. Y.

Jenkins Bros.....New York.

Katzenstein, L. & Co.....New York.

Sayen & Schultz.....Philadelphia.

U. S. Metallic Packing Co.....Philadelphia.

PAINTS.

Baker, Howard H. & Co.....Buffalo.

Smith, Edward & Co.....New York.

Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.

Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.

Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.

Merrell Mfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.

Bourne-Fuller Co.....Cleveland.

Crane Co.....Chicago.

PLANERS OF ALL KINDS.

Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.

Fay & Egan Co., J. A.....Cincinnati, O.

Atlantic Works, Inc.....Philadelphia.

PLUMBING, MARINE.

Mott Iron Works, J. L.....New York.

Reilly Repair & Supply Co., James.....New York.

Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.

Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.

Bertram's Oil Polish Co.....Boston.

Paul & Co., J. C.....Chicago.

PRESSURE REGULATORS.

D'Este Co., Julian.....Boston.

PROPELLER WHEELS.

American Ship Building Co.....Cleveland.

Atlantic Works.....East Boston, Mass.

Bath Iron Works, Ltd.....Bath, Me.

Cramp, Wm. & Sons.....Philadelphia.

Detroit Shipbuilding Co.....Detroit.

Farrar & Trefts.....Buffalo.

Fore River Ship & Engine Co.....Quincy, Mass.

Hardy, John B.....Tacoma, Wash.

Harlan & Hollingsworth Co.....Wilmington, Del.

Jenks Ship Building Co.....Port Huron, Mich.

Lockwood Mfg. Co.....East Boston, Mass.

Maryland Steel Co.....Sparrow's Point, Md.

Moran Bros. Co.....Seattle, Wash.

Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.

Newport News Ship Building Co.....Newport News, Va.

Nixon, Lewis.....Elizabeth, N. J.

Pusey & Jones Co.....Wilmington, Del.</

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....	New York.
Erie & Western Trans. Co.....	Buffalo.
International Nav. Co.....	Philadelphia.
Red Star Line.....	New York.

STEEL CASTINGS.

Seaboard Steel Casting Co.....	Chester, Pa.
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STEERING APPARATUS.

American Ship Building Co.....	Cleveland.
Chase Machine Co.....	Cleveland.
Detroit Shipbuilding Co.....	Detroit.
Electro-Dynamic Co.....	Philadelphia.
Hyde Windlass Co.....	Bath, Me.
Jenks Ship Building Co.....	Port Huron, Mich.
Queen City Engineering Co.....	Buffalo.
Sheriffs Mfg. Co.....	Milwaukee.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....	Cleveland.
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STOCKLESS ANCHORS.

Baldt Anchor Co.....	Chester, Pa.
International Anchor Co.....	Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.

American Bridge Co.....	New York.
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SUBMARINE DIVING APPARATUS.

Hale Rubber Co., Alfred.....	So. Boston, Mass.
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SURVEYORS, MARINE.

See, Horace.....	New York.
Wood, W. J.....	Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....	New York.
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TESTS OF MATERIAL.

Hunt, Robert W. & Co.....	Chicago.
Pittsburgh Testing Laboratory, Ltd.....	Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.

Helios-Upton Co.....	Peabody, Mass.
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TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Cleveland Punch & Shear Works Co.....	Cleveland.
New Doty Mfg. Co.....	Janesville, Wis.
Niles Tool Works Co.....	Hamilton, O.

Standard Pneumatic Tool Co..... Chicago.
Wood, R. D. & Co..... Philadelphia.

TOOLS, WOOD WORKING.

Fay & Egan Co., J. A..... Cincinnati, O.
Atlantic Works, Inc..... Philadelphia.

TOPOPHONE—Prevents disasters in fogs.

Colt Co. J. B..... New York.

TOWING MACHINES.

American Ship Windlass Co..... Providence, R. I.
Chase Machine Co..... Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co..... Kingston, Ont.
Midland Towing & Wrecking Co., Ltd..... Midland, Ont.
Swain Wrecking Co..... Detroit.

TRAPS, STEAM.

D'Este Co., Julian..... Boston.
Haines Co., Wm. S..... Philadelphia.

TRUCKS.

Boston & Lockport Block Co..... Boston.

TUBING, SEAMLESS.

Benedict & Burnham Mfg. Co..... Waterbury, Conn.
Standard Seamless Tube Co..... Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co..... Boston.
Ashton Valve Co..... Boston.
Crane Co..... Chicago.
Crosby Steam Gage & Valve Co..... Boston.
D'Este Co., Julian..... Boston.
Jenkins Bros..... New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.

Smith, Edward & Co..... New York.

VARNISH PAINT.

Mair, John & Son..... Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J..... Buffalo.
Brown & Co..... Buffalo.
Drake & Maytham..... Buffalo.
Elphicke, C. W. & Co..... Chicago.
Hall & Root..... Buffalo.
Hawgood & Moore..... Cleveland.
Helm, D. T. & Co..... Duluth, Minn.
Holmes, Samuel..... New York.
Hutchinson & Co..... Cleveland.
Keith, J. G. & Co..... Chicago.
Mitchell & Co..... Cleveland.
Richardson, W. C..... Cleveland.
Sullivan, D. & Co..... Chicago.

VENTILATING APPARATUS FOR SHIPS.

American Blower Co..... Detroit.
Boston Blower Co..... Hyde Park, Mass.
Buffalo Forge Co..... Buffalo.
Sturtevant, B. F. Co..... Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co..... Chicago.
Baker, H. H. & Co..... Buffalo.
Roebling's Sons, John A..... New York and Cleveland.
Upson-Walton Co..... Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co..... Boston.
Ashton Valve Co..... Boston.
Crosby Steam Gage & Valve Co..... Boston.
Signal & Control Co..... New York.

WINDLASSES.

American Ship Windlass Co..... Providence, R. I.
American Ship Building Co..... Cleveland.
Hyde Windlass Co..... Bath, Me.
Jenks Ship Building Co..... Port Huron, Mich.

WINCHES.

American Ship Windlass Co..... Providence, R. I.
Hyde Windlass Co..... Bath, Me.

WOOD WORKING MACHINERY.

Atlantic Works, Inc..... Philadelphia.
Fay & Egan Co., J. A..... Cincinnati, O.

WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co..... Kingston, Ont.
Midland Towing & Wrecking Co., Ltd..... Midland, Ont.
Swain Wrecking Co..... Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby..... Boston.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son..... Wilmington, Del.
Gas Engine & Power Co..... New York.
Lane & DeGroot..... Brooklyn.
Willard, Chas. P. & Co..... Chicago.

YAWLS.

Drein, Thos. & Son..... Wilmington, Del.
Lane & DeGroot..... Brooklyn.

ALPHABETICAL INDEX OF ADVERTISERS IN THE MARINE REVIEW.

The star (*) indicates that the advertisement appears alternate weeks. For addresses see advertisements on pages noted.

Almy Water Tube Boiler Co.....	11	Detroit Shipbuilding Co.....	1	Kahnweller's Sons, David.....	4	Red Star Line.....	7
American Blower Co.....	40	Detroit Screw Works.....	11	Katzenstein, L. & Co.....	4	*Reilly Repair & Supply Co., James.....	10
*American Bridge Co.....	26	Dixon Crucible Co., Joseph.....	9	Keith, J. G. & Co.....	34	Reynolds, H. J.....	9
American Line.....	7	Donnelly Salvage & Wrecking Co.....	32	Kingsford Foundry & Machine Works..	30	Richardson, W. C.....	34
American Ship Building Co.....	1	Drake & Maytham.....	34	Lake Shore Engine Works.....	1	Risdon Iron Works.....	5
American Ship Windlass Co.....	2	Drein, Thos. & Son.....	4	Lane & DeGroot.....	4	*Ritchie & Sons, E. S.....	30
American Steam Gauge Co.....	1	Duluth, South Shore & Atlantic Ry....	39	Lidgerwood Mtg. Co.....	10	Roach's Ship Yard.....	5
American Steel & Wire Co.....	1	Electro-Dynamic Co.....	1	Lockwood Mfg. Co.....	4	Roberts Water Tube Boiler Co.....	11
Armstrong Cork Co.....	40	Elphicke, C. W. & Co.....	34	"Long Arm" System Co.....	3	Rochester & Pittsburgh Coal & Iron Co.....	33
Ashton Valve Co.....	12	Elwell-Parker Electric Co.....	2	L. S. & M. S. Ry.....	39	*Roebling's, John A. Sons Co.....	40
*Atlantic Works.....	5	Erie & Western Trans. Co.....	32	McMyler Mfg. Co.....	8	Rushmore Dynamo Works.....	4
*Atlantic Works, Inc.....	6	Falls Hollow Staybolt Co.....	4	MacDonald, Ray G.....	34	Safety Car Heating & Lighting Co.....	31
Babcock & Wilcox Co.....	11	Farrar & Trefts.....	5	MacKinnon Mfg. Co.....	8	Sands, Alfred B. & Son.....	10
Baldt Anchor Co.....	9	Fay & Egan Co., J. A.....	7	Mair, John & Son.....	6	Sayen & Schultz.....	1
Baker, Howard H. & Co.....	6	Fields, J. M.....	34	*Marine Iron Co.....	7	Scherzer Rolling Lift Bridge Co.....	6
Bath Iron Works, Ltd.....	1	Fletcher, W. & A. Co.....	4	Martin-Barriss Co.....	8	Scott Co., The W. L.....	32
Benedict & Burnham Mfg. Co.....	28	Fogg, M. W.....	31	Maryland Steel Co.....	5	Seaboard Steel Casting Co.....	29
Bertram's Oil Polish Co.....	1	Fore River Ship & Engine Co.....	5	Merrell Mfg. Co.....	5	See, Horace.....	34
Bessemer Steamship Co.....	8	Garlock Packing Co.....	28	Midland Towing & Wrecking Co., Ltd..	40	Seidler-Miner Electric Co.....	8
Big Four Railway.....	39	Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....	31	Miller, Walter.....	9	Sheriffs Mfg. Co.....	10
Blake, Geo. F., Mfg. Co.....	9	General Electric Co.....	12	Mitchell & Co.....	34	Shipowners Dry Dock Co.....	12
*Bliss, John & Co.....	30	Gilchrist, Albert J.....	34	Monongahela Iron & Steel Co.....	3	*Signal & Control Co.....	7
*Bloomsburg & Co., H.	31	Gleason-Peters Air Pump Co.....	9	*Mott Iron Works, J. L.....	10	Skinner Chuck Co.....	3
Boland, J. J.....	34	Goulder, Holding & Masten.....	34	Mulholland, M.....	33	Smith, Edward & Co.....	1
Boston Blower Co.....	4	Graphite Lubricating Co.....	9	Neafie & Levy Co.....	5	Smith, Stanley B. & Co.....	33
*Boston & Lockport Block Co.....	40	Great Lakes Register.....	7	*Newhall Chain Forge & Iron Co.....	30	Stratford Oakum Co., Geo.....	32
*Boyer Water Tube Boiler Co.....	31	Haines Co., Wm. S.....	9	Newport News Ship Building & Dry Dock Co.....</td			

OHIO FUEL COMPANY.

We furnish only the best grade of

PITTSBURG
AND GOSHEN Steam Coal.

Facilities for loading promptly
day or night, by recent purchase
of lighter—capacity 300 tons.

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OFFICE PHONES: { BELL MAIN 526.
CUYAHOGA C 240.

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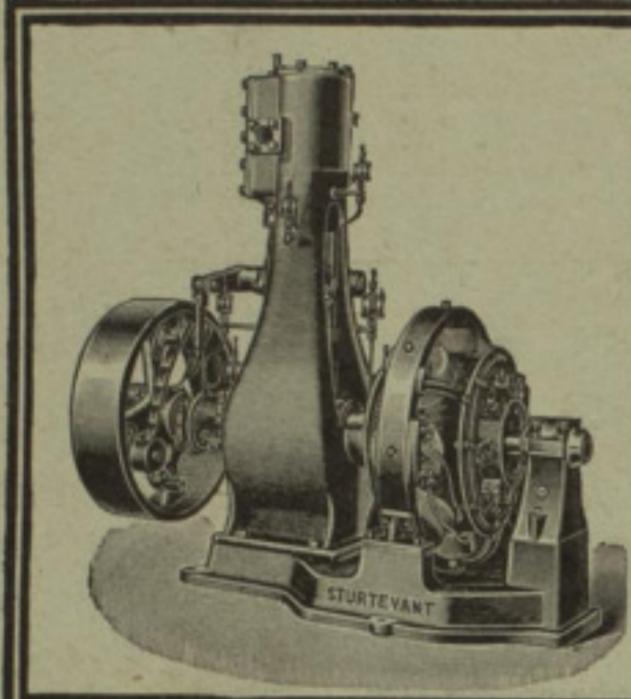
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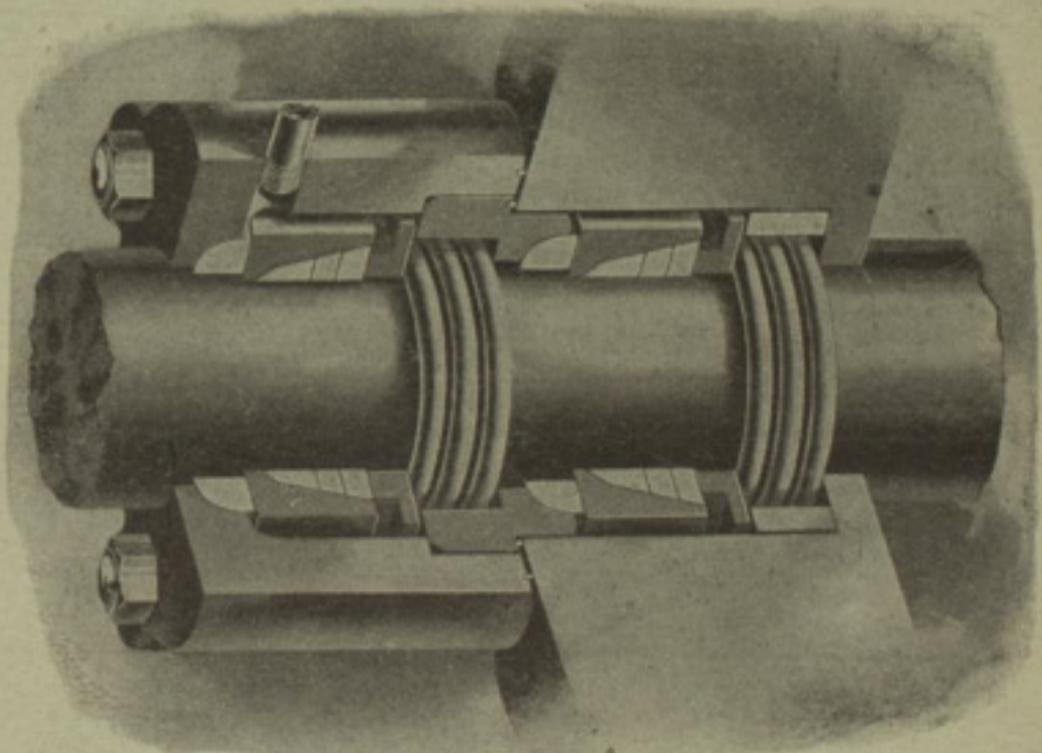
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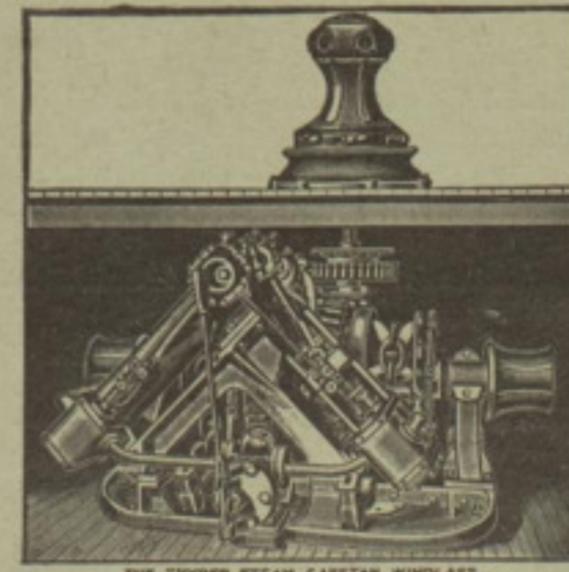


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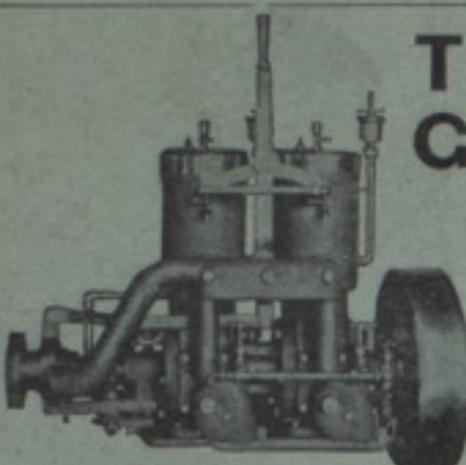
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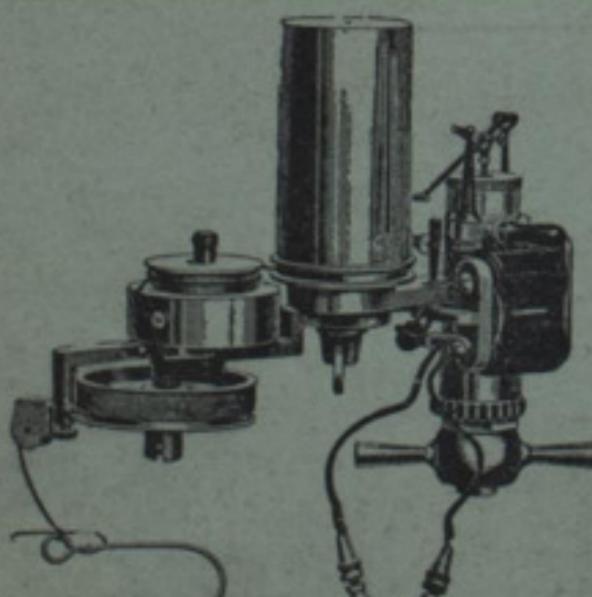
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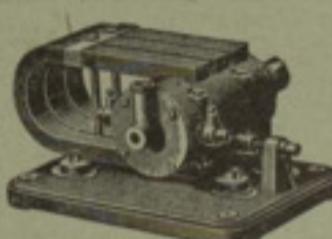
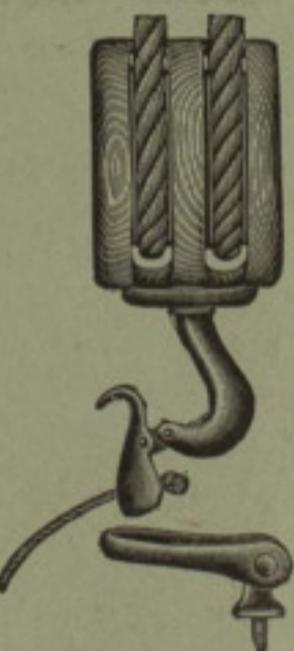


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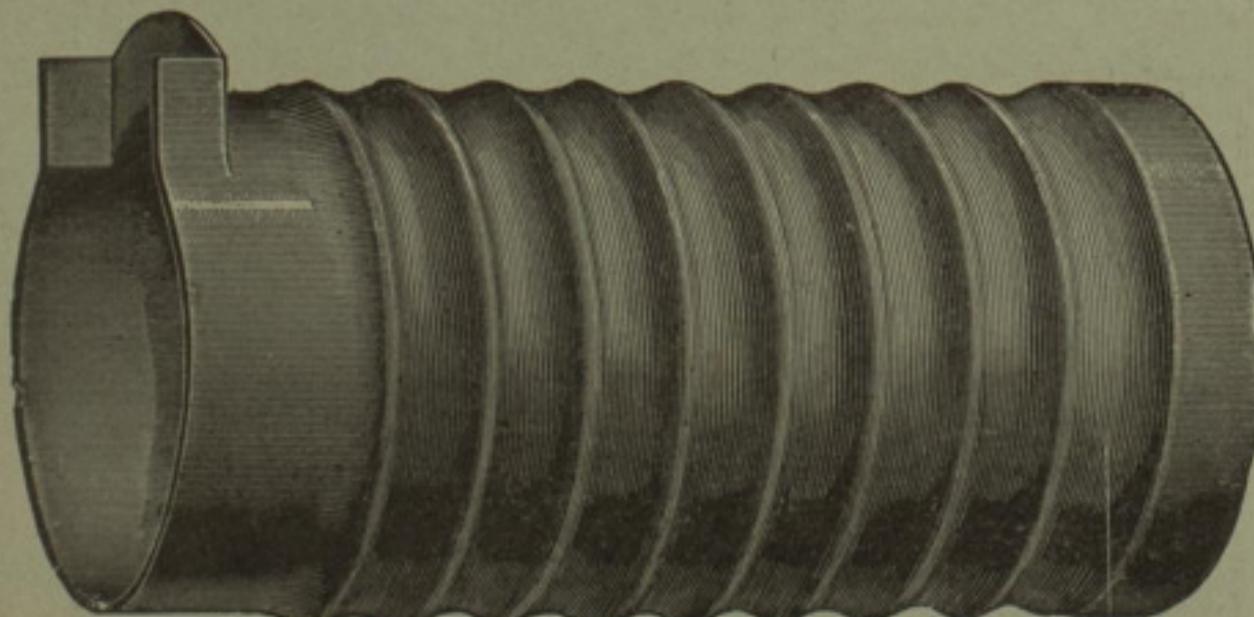
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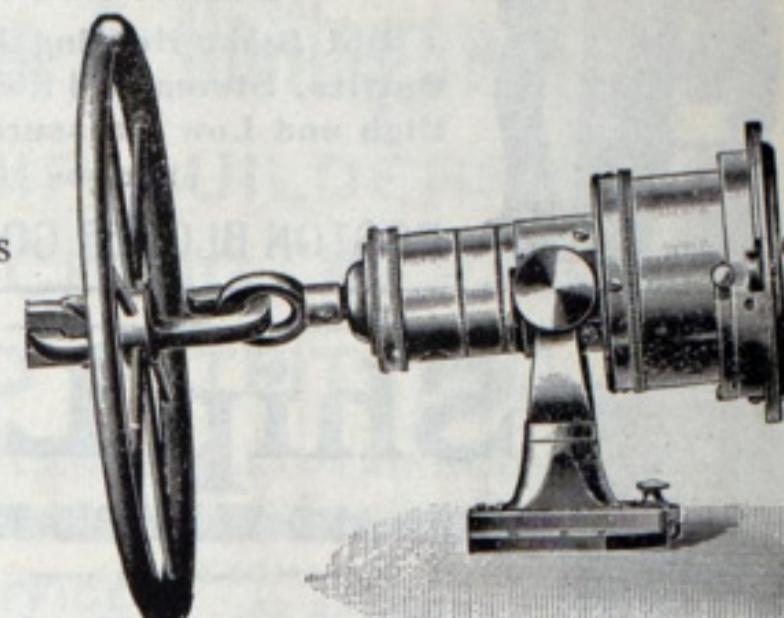
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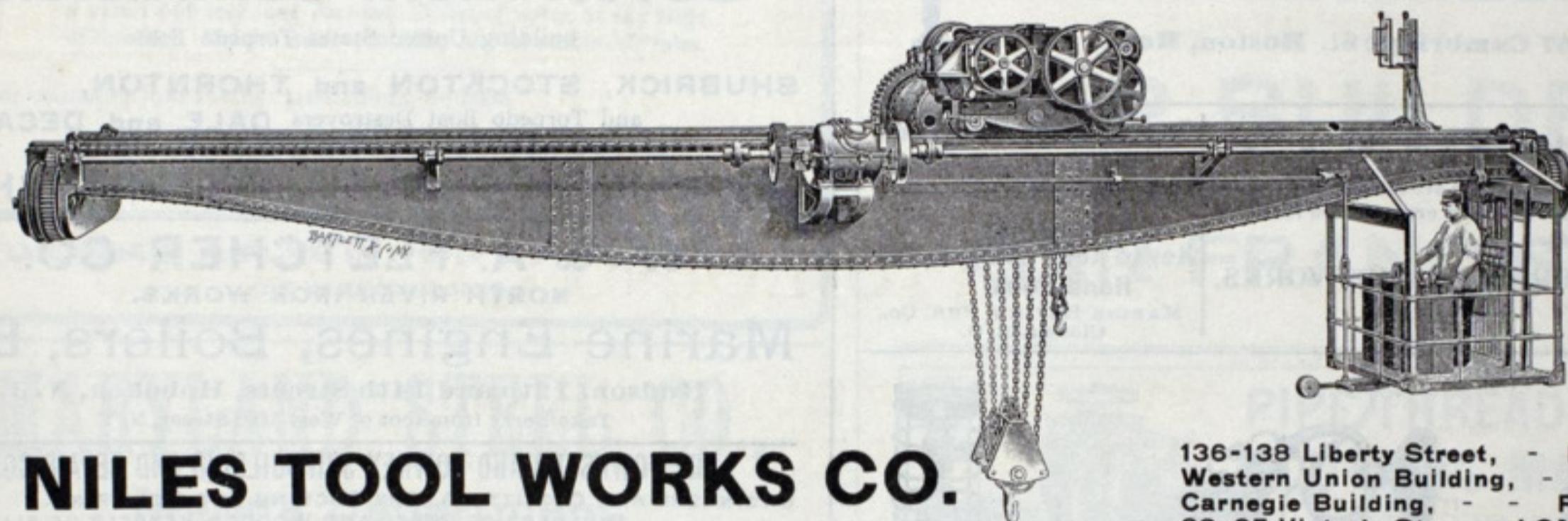
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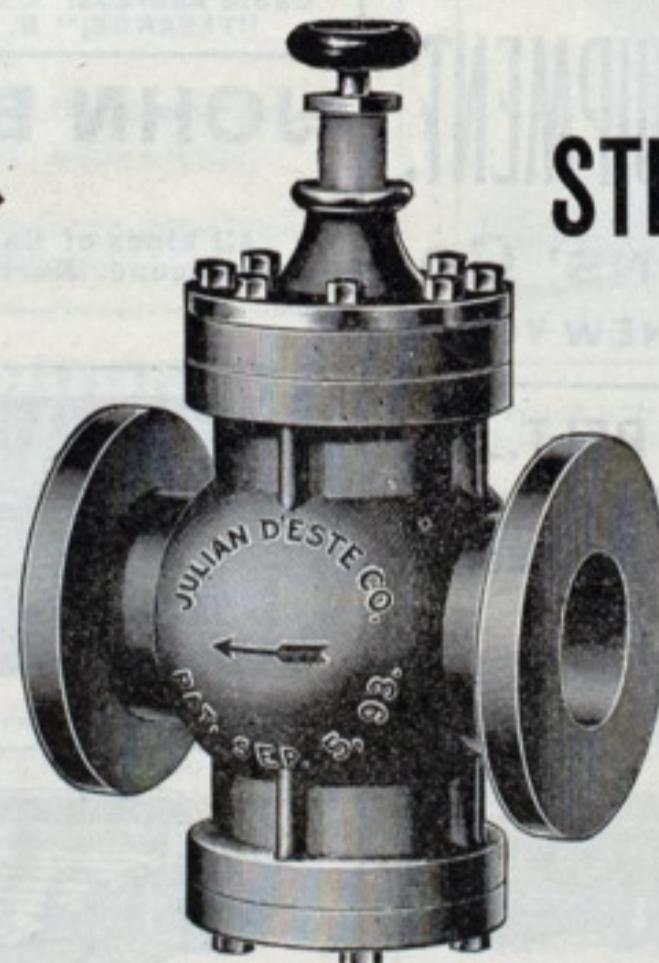
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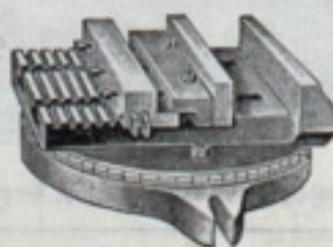
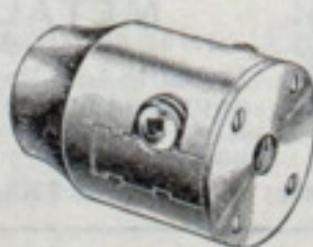
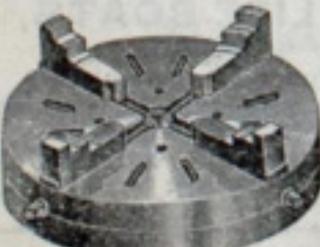
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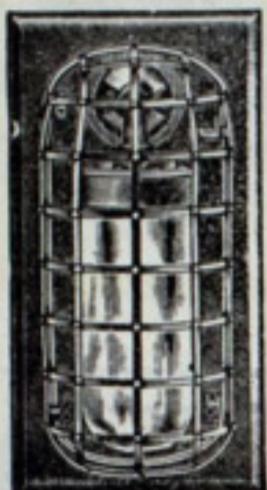
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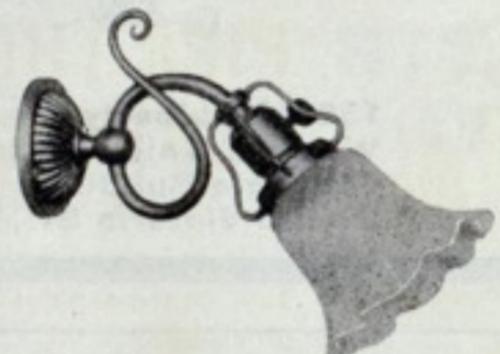
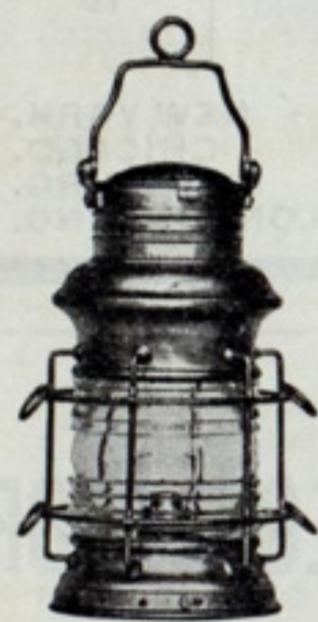
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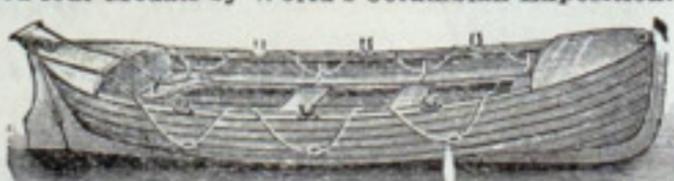
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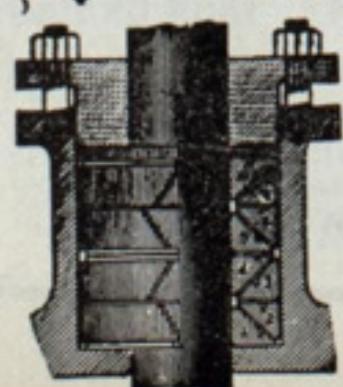
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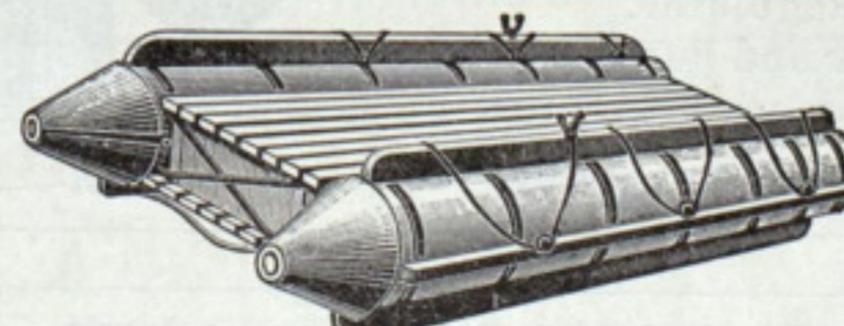
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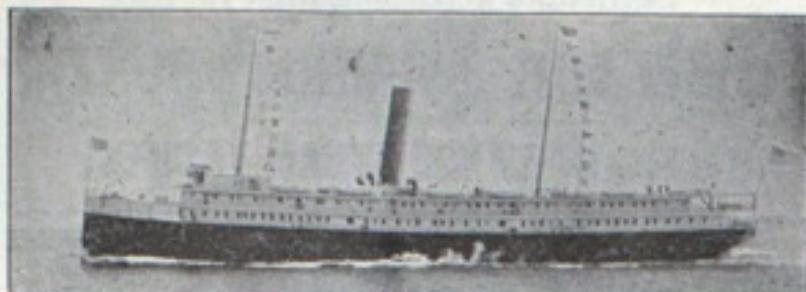
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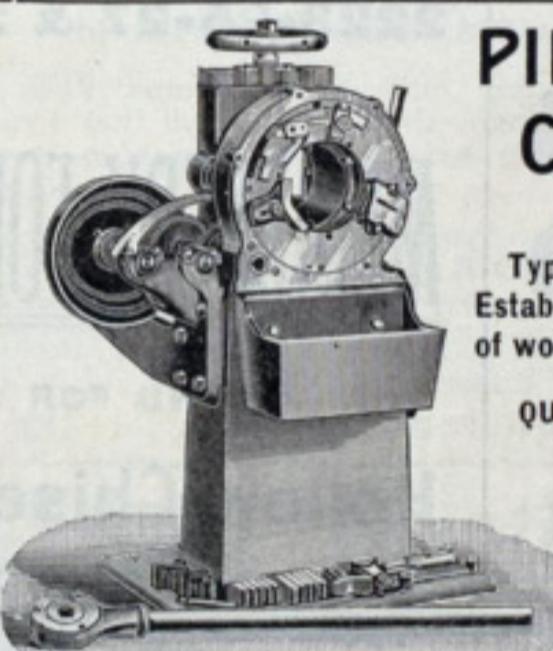
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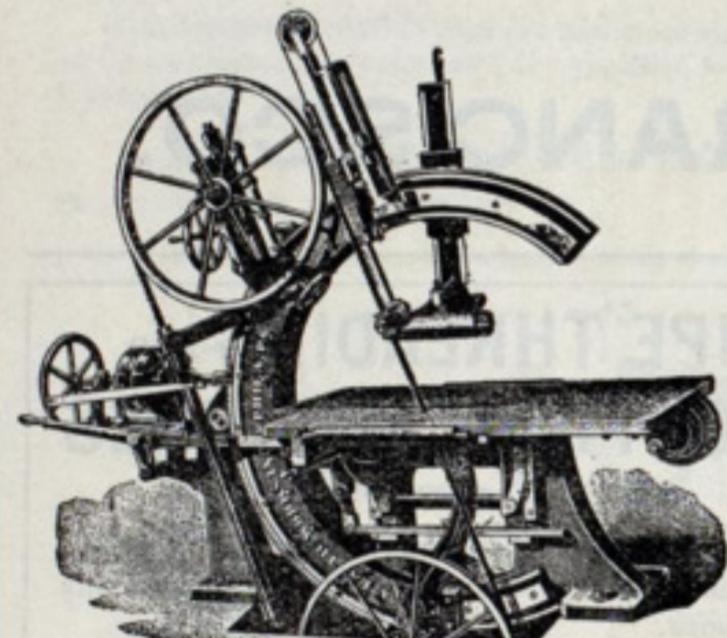
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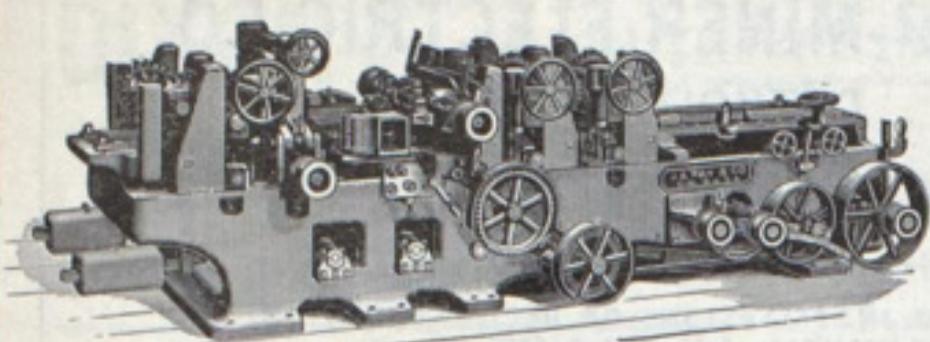
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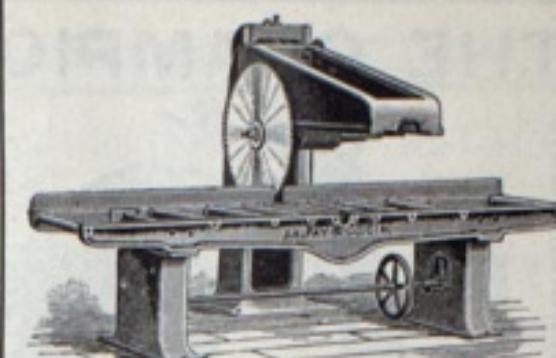
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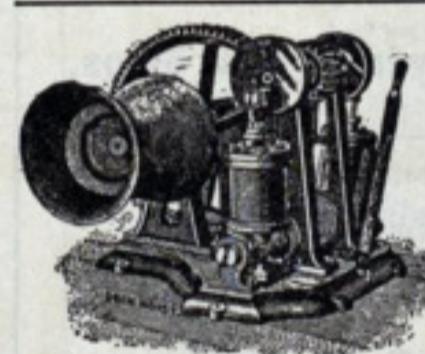
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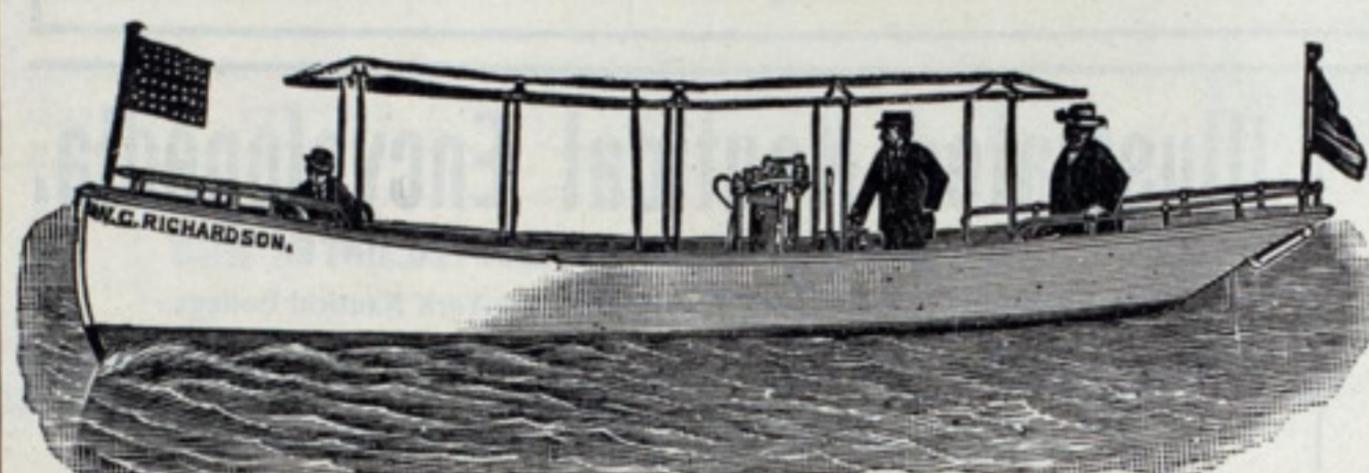
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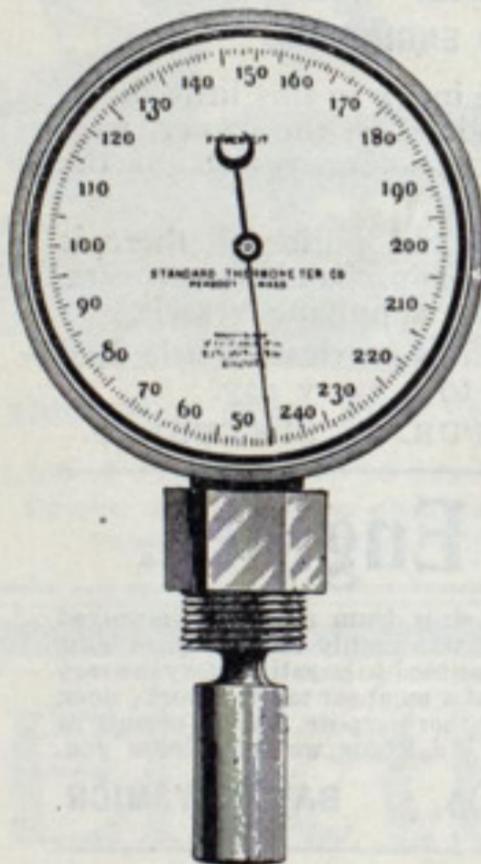
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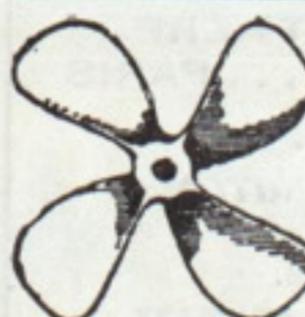
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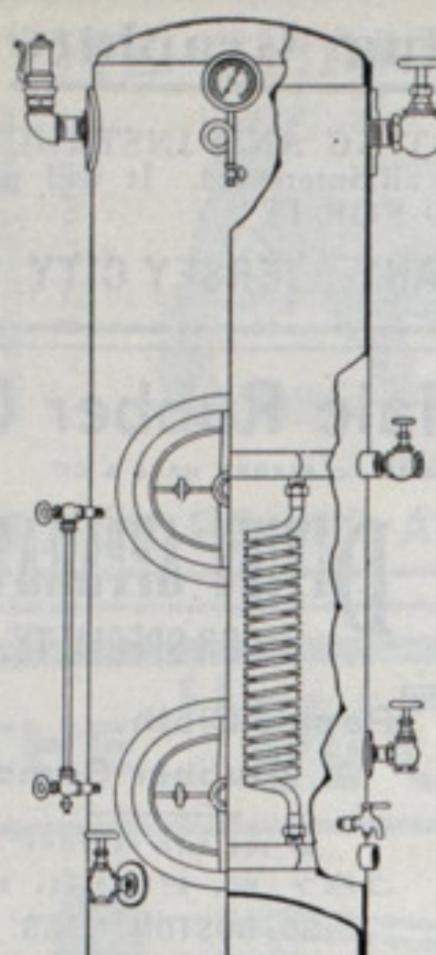
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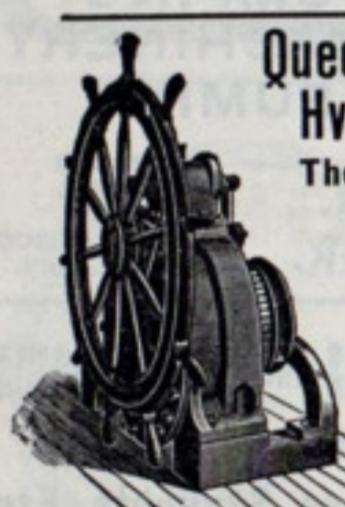
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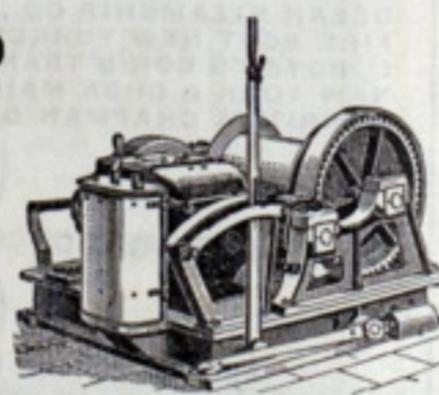
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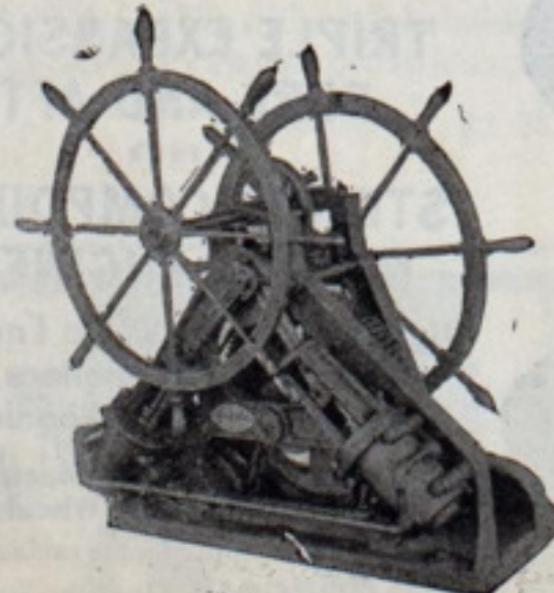
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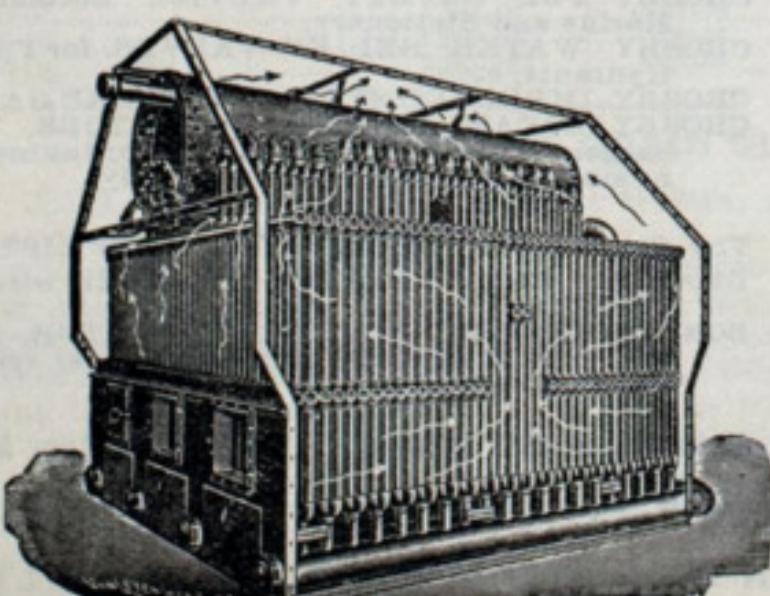
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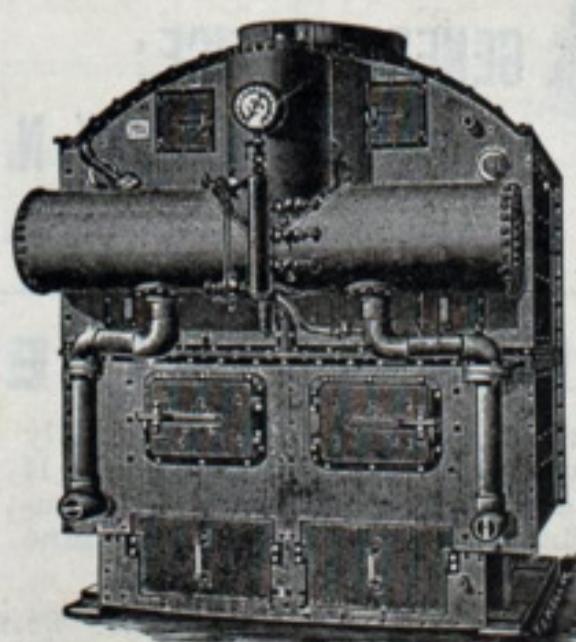
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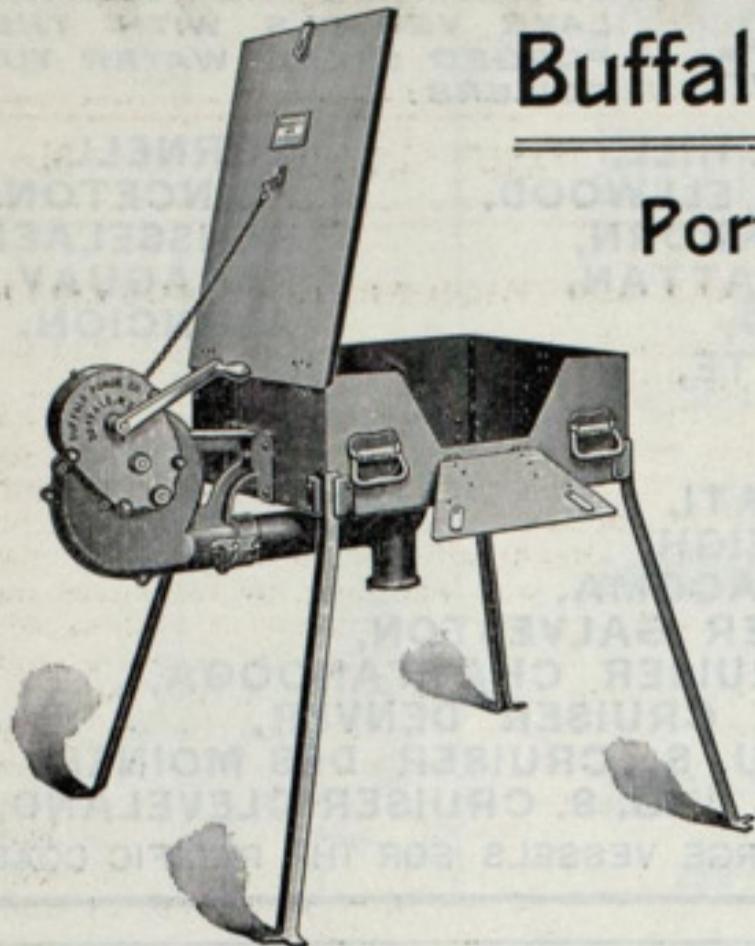
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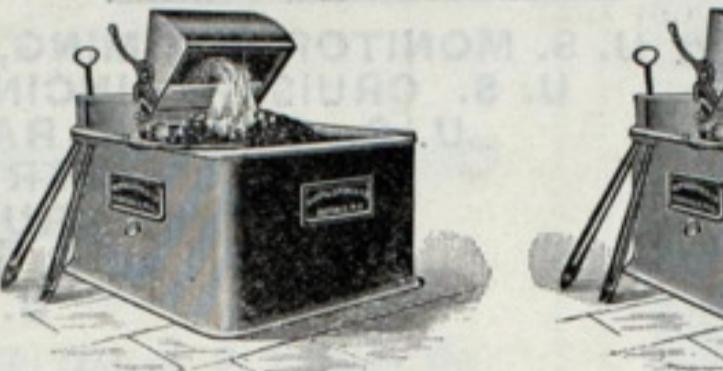
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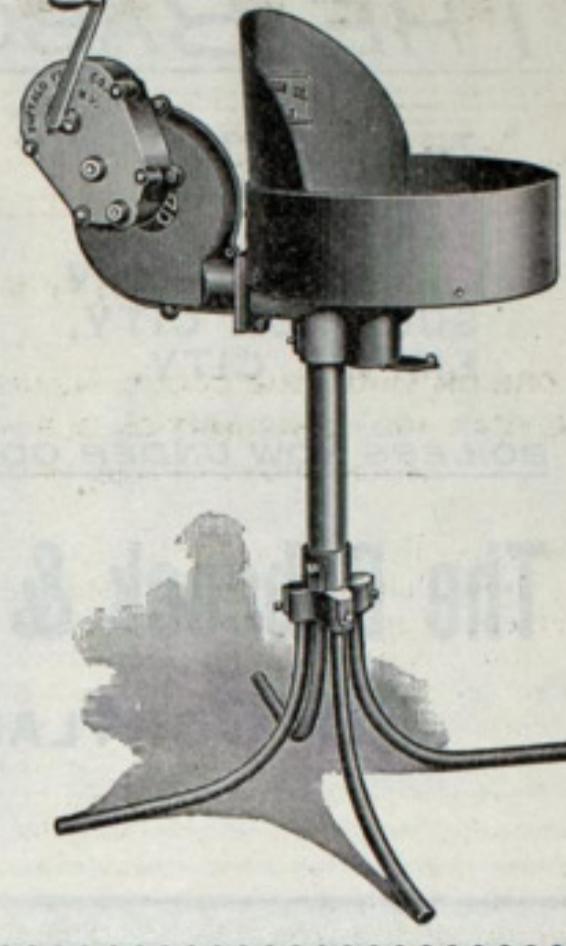
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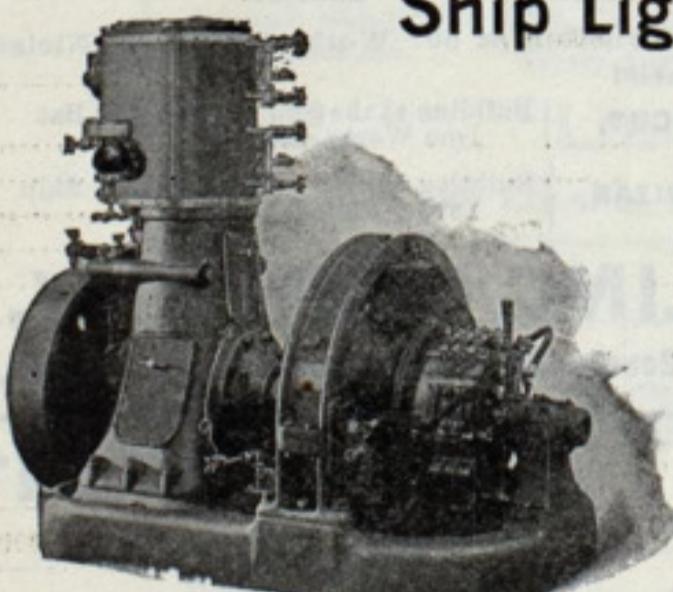
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